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GEOGRAPHICAL REVIEW

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THE ECONOMIC RESOURCES OF THE RUSSIAN EMPIRE

By E. K. REYNOLDS

One of the far-reaching results of the war in this country has been the stimulation of an interest in Russia. This is not exactly a new thing. Americans have for a long time been interested in the great writers, composers, and artists, as well as the politics of Russia. There was a time even, not long since, when Americans were more occupied with conditions in Russian prisons than in their own. But all that has little in common with this new interest, which is pointed toward the discovery of a new Russia, hitherto unsought and unknown,—economic Russia. Politics and fiction are brushed aside, and Russia is being evaluated in terms of her economic possibilities. Americans are beginning to study the growth of the Russian Empire and its wealth in natural resources.

The story of the expansion of a country which has resulted in the largest compact political organization the world has ever seen is necessarily an interesting one. The beginnings of Russian history, like that of every country, are but vaguely known. The foundation stone of the Russian state was laid in Novgorod in 862 A. D., but it was a century or two earlier that a group of Eastern Slavs came down from the Carpathians and settled on the banks of the Dniepr. There they built up a flourishing trading state, with its center at Kiev. The Dniepr became the great trade route; amber from the Baltic and furs, honey, and wax from the forests along its banks were carried down to Constantinople, while gold, silver, stuffs, wine, and fruits were brought up the river in return.

In those days of prosperity, the Eastern Slavs, later known as Russians, were free to develop their local institutions, and, according to all accounts, they governed themselves in an extremely democratic way. They had their princes, but these constituted little more than military leaders and were bound in every way by the will of their subjects as expressed through their common council. Then came the fateful day when the Russians had to sacrifice everything to stem the rising tide of Tatar invasion. They were defeated, but their dead bodies formed a rampart which checked the yellow

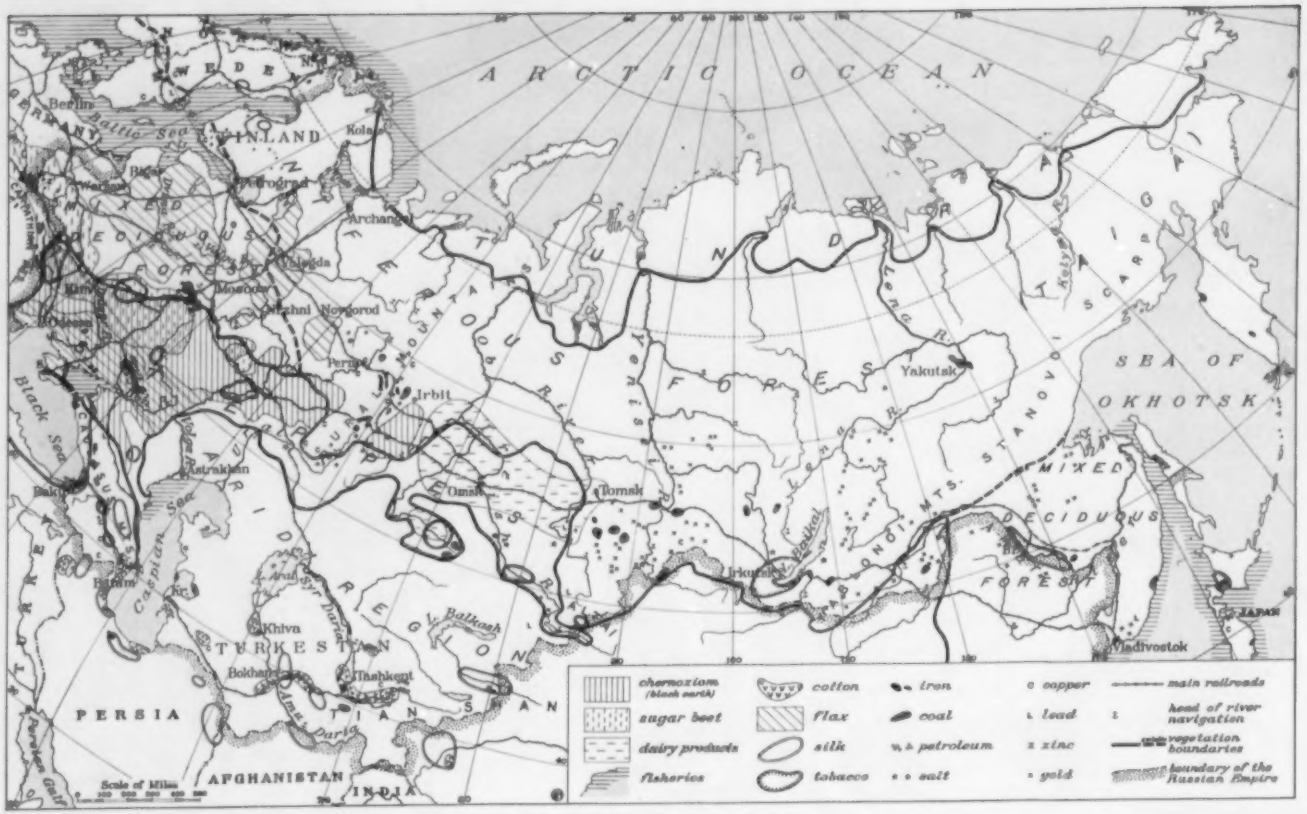


FIG. 1—Sketch-map of the economic resources of the Russian Empire, based on Unstead, Bartholomew, Scobel, and other sources. Scale, 1:45,000,000.
NOTE: Baku and Batum should be transposed.

hosts and saved Europe and Western civilization from their onslaught. The price that Russia had to pay for this and the real significance of her act are far from being fully appreciated by her western neighbors. Those same nations who have to thank her for almost their very existence can find nothing better to do, now that she is emerging from her bitter, century-long struggle to take her place in the front rank of the peoples of the world, than to make faces at her backwardness.

For Russia, the Tatar invasion had the most terrible consequences. It meant the wiping out of the whole political organization which she had developed along such democratic lines. To escape the oppressive rule of the invaders, many returned to the Carpathians, to Galicia, but the majority moved to the northeast, from Kiev in the general direction of Moscow and the upper reaches of the Volga. Here they found themselves suddenly confronted with the grim task, first of conquering new homes from hostile Finnish tribes, then of wringing an existence from nature in the dark, endless forests and marshes of the North, fighting starvation and absorption year after year. These were the conditions under which the "Great Russians" came into being. Racially the same as the "Little Russians" of the lower Dniepr, their character underwent a change which has persisted to this day. The care-free, unrestrained gaiety of the early days, when they were a happy-go-lucky, prosperous nation of traders, was hammered out of them by the circumstances of their daily life, and the Great Russian peasant was born sturdy, resolute; watchful and mindful of every move of nature, he was ready for and resigned to any hardships.

In this new order of things, Moscow became the center of gravity in place of Kiev. Its geographical position justified this, because, being situated on a tributary of the Volga, which flows all through eastern Russia down to the Caspian, and at the same time being near the headwaters of the Dniepr, the trade route from the Baltic to the Black Sea, it naturally became the economic center of Russia. Moreover, with the fall of Kiev the religious center was shifted to Moscow. Finally, and this is the most important reason, it was the prince of Moscow who had the perspicacity to insinuate himself into the good graces of the Tatar ruler and to learn from him the art of powerful, centralized government. He was made tax-collector for the khan, and in this way practically all the Russians were brought under his control. Then at a given moment he used the power vested in him by the Tatars to turn against his master and refused him further allegiance. This was the beginning of a long and bloody struggle. While in western Europe the arts and sciences were free to flourish and nations could progress, Russia had to keep her lonely vigil at the eastern gate.

Fighting step by step, the Russians followed the great plain to its limits, wandering up to the White Sea, eastward across the Volga to the Urals, and across the Urals into the level land of western Siberia. They spread

FIG. 2—The main street in the Fair, Nizhni-Novgorod.

The Fair forms a town by itself, which lies across the Oka River at its junction with the Volga (see Fig. 3). Its booths and warehouses are the scene, every summer, of transactions involving goods to the value of $125,000,000 and attracting 400,000 visitors.

in every direction, continually advancing their frontiers toward the sea, the sea which would be a barrier to their enemies and an outlet for their trade. They succeeded in establishing themselves definitely on the northern shore of the Black Sea, only to find themselves blocked at the Dardanelles. In the east they broke their way through the mountains of eastern Siberia to plant their flag on the shores of the Pacific. But the Pacific was three months' travel from Moscow. The Baltic then seemed to offer the solution to the problem, and Sweden was forced to cede the territory on which Petrograd now stands. This, in brief, is the story of the expansion of the Russian land from a settlement on the Dnieper, northward, southward, eastward, to the Arctic Ocean, the Black Sea, the Caspian, the confines of China, and the shores of the Pacific.

At present the Russian Empire encompasses 42 degrees of latitude and no less than 173 degrees of longitude, that is to say, it doubles the extent of the United States in length and nearly triples it in breadth. The Empire State of New York could be easily set down in the 8,647,657 square miles of the Russian Empire's area 165 times; while Russia, west of the Urals alone, is 10 times the size of France, and 33 times the size of England and Wales. European Russia takes up over one-half of Europe, and Asiatic Russia over one-third of all Asia. So we find Russia occupying more than one-seventh of the total land surface of the globe.

In discussing the various parts of this gigantic whole, custom has fixed a dividing line between east and west in the Ural Mountains. This boundary, however, is, like the equatorial line, more fictitious than real. European Russia and western Siberia are, generally speaking, one vast plain, which slopes on the north to the Arctic Ocean and on the south to the Black Sea and the Caspian. This great plain is barely broken by the Urals: in their central part, where the Trans-Siberian railroad crosses them, the ascent is so gradual that one is not in the least aware of ascending, until at a given moment a sign post is reached which points in one direction, "to Europe," in the other "to Asia." A slight change in the character of the vegetation is also noticed. But before and behind are the great sweeps of level country.

To the Asiatic side of the Urals the farmers from the other end of the plain have been flocking for years, in spite of the ill repute that accompanies a penal settlement. They find natural conditions very little different from the European side, but they find a virgin soil, a chance to start life afresh. They are usually prosperous and happy and less restricted by government regulations. These are the builders of the new Russia. In them there is all the living promise of the future. They have the backbone of the race; they are of the purest Russian stock; and, at the same time, as pioneers in a new country, their vision is broader, they are untrammeled by convention, they are as fresh and vigorous as the untamed nature around them.

Both here and in European Russia, life is more or less the same. That,

FIG. 3—View of Nizhni-Novgorod and the Fair across the Oka River.

FIG. 4—The plain of the Dniepr at Kiev.

FIG. 5—One of the busy streets in the Fair, Nizhni-Novgorod.
(Photo copyright by Underwood & Underwood.)

FIG. 6—Russian peasants making hay.
(Photo copyright by Underwood & Underwood.)

too, is the result of the plain—allowing of no differences, the creator of endless monotony. You travel for days and days, north and south, east and west, without finding any appreciable variety in the landscape, unless it be a change from the log cabin of the forest region of the north and center to the white, plastered, thatched cottage of the southwest. This, of course, is a very general statement. There are distinct zones of vegetation, which vary, according to the climatic conditions, from the Arctic Circle to the Caucasus and Central Asia.

First of all in the extreme north, from the White Sea to Bering Strait, there lies the region of the tundras—waste frozen marshes stretching inland from the sea for from three hundred to a thousand miles. It is often difficult to determine the point separating the land from the sea, for the surface of the ground is frozen some forty feet deep; even the heat of summer can thaw only about two feet of top soil. The only possible vegetation consists of moss and a few berry bushes—scant food for the millions of birds and beasts of all kinds that flock northward in July and August to escape their enemy, the hunter. By the end of August, however, the heavy frosts set in, and the tundras become a barren, lifeless desert, covered with snow for hundreds of miles, with never a living speck of any kind on which to rest one's eyes.

To the south of the tundras is the great coniferous forest belt, which stretches from Finland to the Sea of Okhotsk. At its western end, where it is more settled, this is perhaps the most beautiful part of the great Russian plain. The countryside is dark with the shadows of the fir trees, but frequently shot with the light, lithe trunks of silver birches. The aspect of the land, too, is slightly rolling in parts, and cradled between these slight elevations there are thousands of charming little lakes fringed around with reeds.

In Siberia, the forest region is called the *taigá,* which means a vast, more or less unknown surface, covered with dense, impassable forests. Heavy underbrush, fallen trunks, and endless quantities of game are its chief characteristics. Comparatively little of the *taigá* has been reclaimed, that is, turned into farming land. One reason is that the climate here is so extreme and the winters so endlessly long. The cold is so intense that an occasional tree splits open, making a noise like the report of a pistol. It is so cold that the warmth from the body of a bird, as it rises from the ground, will leave a streak of steam. Added to this is the annoyance from the swarms of insects characteristic of Arctic summers. The pioneer settlers had to live in houses filled with smoke to get any relief from them, and they had to build huge bonfires in the pasture lands to protect the cattle.

Yet this *taigá* is one of the greatest treasures in Russia's long list of natural resources. In round figures it is said to represent ninety million acres of magnificent timber. That is less than one-tenth of all the timber resources of the Empire, which are estimated at one and a quarter billion

acres. In addition to the great northern forest belt, there are extensive forests on the Urals and the Caucasus. The trees of the *taigá* are pines, firs, spruces, larches, and allied species, intermingled here and there with various kinds of birches, aspen, and a few other leafy trees. At its western end, in the central provinces of Russia, the *taigá* abuts upon the mixed deciduous forest which covers all of cool-temperate Europe. Oak, maple, elm, ash, and poplar are the chief trees. The Mediterranean vegetation of southern Crimea and the eastern Black Sea littoral contains such species as the cork-oak and the yew.

Even to guess at the actual value of these forests would be futile, for they are barely touched as yet. Nevertheless, Russia has exported yearly of late $81,800,000 worth of timber of various kinds, principally to England, Belgium, Germany, and Austria,—this in spite of the enormous home consumption. All northern and central Russia is built of wood, stone being scarce and inaccessible. It is said that all Russia burns down every seven years! The Russians use wood almost exclusively as fuel, both on the railroads and for heating. It is interesting that in renting an apartment one pays a round sum which includes so many cords of wood for heating purposes. The Russians also employ wood very extensively for utensils and implements of various kinds. Fortunately, there are forest preservation laws. These do not enforce the replacing of trees, as is the case, for instance, in Germany, but a forest cannot be cut more than once in a period of eighty years. In any case, Russia has an abundant supply of timber for the present and a good bit of the future in her great forest regions, enough for herself and her friends.

These same regions are a source of great wealth for a second reason. They are teeming with game of all kinds. Hunting, therefore, is naturally the means of support for many, whether Great Russian peasants in the west, Siberian hunters and trappers in the east, or wild tribesmen in the forests of the Urals or out-of-the-way places of the Empire. Here, again, it is impossible to ascertain the extent of the hunting done, except from the skins and birds that are brought to market. There are regular centers for trading in skins. Yakutsk in eastern Siberia is one of the largest markets, and there is a fair held in Irbit, in the Urals, every year, which is given up entirely to barter in skins. Here the traders buy up the sables and ermines for which the Ostiaks have hunted along the Ob, or the Tatars and Soiols in the Altai ranges, or the Yakuts in the region of the Yablonoi or Stanovoi Mountains. The variety in the game is astounding. The skins range from $10.00 for Arctic fox to $50.00 for dark sable. With this abundance of supply, it surprises at first that furs ready for wearing apparel should be so expensive in Russia. The reason for this is that no furs are dyed in Russia. The skins are sent mostly to Leipzig, prepared and dyed, and then shipped back to Russia, laden with duties.

On the outskirts of the forest zone, in the provinces of Vologda and

Yaroslavl (east and southeast of Petrograd) and in the Baltic provinces, lies the great flax-growing country—4,050,000 acres given up solely to this industry. Flax has been grown here for centuries and has given to Russian linen its high reputation. The flax for the finer uses comes from the Baltic provinces and that for the coarser products principally from Vologda, the home of the strikingly beautiful Russian laces, drawn-work, and embroideries which have brought to the outside world a realization of the unusual artistic ability of the Russian peasant.

To the south of the forest zone in European Russia and western Siberia, lies the open country, usually known as the steppe region. At the very mention of the name "steppe" many assiduous readers of pseudo-Russian fiction will smile knowingly and conjure up visions of a Russian Wild West —overrun with ferocious Cossacks, and probably a sprinkling of Kalmyks. As a matter of fact, however, the wild riders of the plain have been superseded by the farmers. The plow has robbed the horses and sheep, even in the southernmost parts, of their fertile pastures. In traveling southward now one sees nothing but farm lands, fields of grain everywhere, until the very edge of the Black Sea is reached. The steppe is principally the granary of Russia. Hundreds and thousands of tons of wheat, rye, oats, and barley are harvested every year. In the crop of 1914 there was nearly 400,000,000 hundredweight of spring and winter wheat alone. Some of the best grain-raising tracts are found in the "black earth" region, the *chernoziom*. This is a band of unusually fertile land, stretching from the neighborhood of Kiev in southwestern Russia in a general northeasterly direction to Tambov and the middle stretches of the Volga and somewhat beyond. It covers an area of 270,000,000 acres and, if farmed to its fullest extent, could more than feed the whole population of Europe.

To the south and east, though the climate is much drier, the grain is very good and plentiful. It was from these driest parts of the grain-producing country that Russia sent help to our state of Kansas when the continued droughts there had ruined the entire crop. The state was in a very sad predicament for a time. The situation was saved, however, by introducing the Russian grain, which had adapted itself to drought, and could therefore flourish in Kansas.

The best wheat comes from Siberia. The frozen ground thaws with the rays of the summer sun and gives to the grain a steady but just sufficient supply of moisture to produce a full, but firm wheat. Western Siberia is given up more to hay fields than to wheat fields. This is the center of the dairy industries. In 1913, 123,000,000 pounds of butter were exported—enough not only to feed Russia, but also to send to England and, in small amounts, to the United States.

To the south of the steppes of western Siberia lie Russia's Central-Asian possessions, the fourth largest cotton-producing area of the world. Since ancient times this territory has been irrigated and cotton has been raised

here, though not in very great quantities. Russia used to obtain most of her cotton from China. Now the tables are somewhat turned, and many of the blue cotton coats worn by John Chinaman come from Russia. There has been a great increase in cotton growing in Central Asia and in eastern Transcaucasia; during the last decade the sowings have multiplied by three hundred and fifty times. Although over 1,300,000 acres, with

FIG. 7—The heart of Moscow, with the buildings of the Kremlin in the background.

a yield of over 9,250,000 hundredweight, are planted, the domestic supply is not equal to the demand, and nearly half of Russia's supply of raw cotton has still to come from abroad, from America or the British possessions.

Central Asia, particularly Turkestan, is also the original home of Russian silk. From time immemorial the raising of Bagdad cocoons and the weaving of silk have been a staple means of support for the population.

From Persia Russia took a section of her silk-producing country when the Caucasus was conquered, and with it the province of Erivan, whose silks were famed even in the old epic tales of Russia. A great many cocoons, of the Italian variety, are raised in southern Russia. The industry, however, is quite sporadic, and it is difficult to know exactly how much is produced there. The total yield of cocoons in all three of these areas amounts to nearly 160,000 hundredweight a year. The fact that here, as usual, the domestic supply cannot meet the demand agrees strangely with the fact that Russia in 1913 exported $2,300,000 worth of cocoons, in raw silk and silk fabrics. The reason is that Russia has not yet built enough silk-winding factories. She is still dependent on foreign countries, France particularly, for fine silk fabrics and for wound silk (which is often made from Russian cocoons!)

Since the construction of the Transcaspian railroad, which opened up markets in European Russia, and consequently abroad, for the products of Russia's Central-Asian possessions, these regions have proved themselves a source of great wealth, not only because of their cotton and silk, but also because of the magnificent fruit which is being raised there in increasing quantities—luscious and fragrant apples, which turn translucent in the sun, apricots, pomegranates, figs, etc. The gardens of Central Asia are able to grow an extraordinary variety of products. Fruit culture is also increasing in the Caucasus and southern Russia; extensive orange plantations have been set out, and their fruit has become extremely popular now that the war has cut off the usual supply of oranges from Italy. Land is being reclaimed and set out in fruit farms around Astrakhan. The Crimea, with its extremely mild climate, has, of course, always been a great fruit-growing center; and Bessarabia, near the Rumanian frontier, is particularly noted for its apples and vineyards. The Russians are very fond of fruit, particularly dried, or in the form of fruit pastes or preserves, often using jam in their tea instead of sugar.

The real Russian tea, not that generally known to us and which comes to Russia from China, is being grown now in fairly large quantities. In 1913, 2,130 acres in the Caucasus, on the Black Sea coast, produced nearly 1,200,000 pounds. Russia is the only tea-growing country in Europe. The plantations, started by Chinese workers, are growing quickly and giving very satisfactory results.

Tobacco is raised either from native, American, or Turkish seeds. In 1912 there were over 175,000 acres under tobacco, in southern Russia, Siberia, and Central Asia, with an annual yield of over 2,350 hundredweight; seventy per cent of this is grown from native seeds. This tobacco is called *makhorka;* the ordinary peasant smokes it, and it is recognized from afar because of its extremely pungent odor. American and Turkish tobacco is also raised in southern Russia and in the Caucasus.

These are but a few items in Russia's vast storehouse. She has nearly

2,000,000 acres in sugar beets, Little Russia, the southwestern region of the country, giving the highest yield and the best beet.

But she possesses one especial jewel which places her in the front rank of the wealthy nations of the world, her mineral resources—iron, oil, copper, gold, and precious stones. In the province of Ekaterinoslav, north of the Crimea and the Sea of Azov, lies the great Donetz coal basin, the largest coal field in Europe, containing about a billion tons of flame and coking coal and two and a half billion tons of anthracite. These are the best exploited of the coal mines of the Empire, because of the facilities for transportation and because of their close proximity to enormous beds of iron ore. This region, from being pastoral and agricultural, has become the "black country" of Russia. Busy industrial settlements have sprung up, and, as at Pittsburgh, the sky at night is lurid from the flames of many gigantic blast furnaces.

Then there are the great Dombrova coal fields of Poland, said to contain 855,000,000 tons; and millions of tons of inferior coal in the Moscow region. The rest of the coal deposits are still almost inaccessible. The Caucasus, for instance, is very rich in coal and is said to contain billions of tons, while the coal fields in Asiatic Russia, particularly in the province of Irkutsk, are even richer. One hundred and fifty billion tons are claimed for that one region alone. The supply in the Urals is destined to play an important part in the industrial life of the country, as soon as railroads and labor make these mines sufficiently accessible. One must always add labor to the obstacles in the way of developing the mines, because, being primarily agriculturists, the miners prefer to leave their work and go back to their farms during the harvest time, so that, while the grain is ripening and being gathered in, the amount of labor available for the mines is reduced to a low figure. Nevertheless, in time, the seventy-five billion tons of coal in European Russia and the one hundred and seventy-five billion tons of Asiatic Russia are bound to come into exploitation in the natural course of events.

This is also true of the iron resources of Russia. There are big iron centers in southern and central Russia, Poland, and the Urals. The largest deposits, and those with the purest ore, lie along the southern border of the province of Ekaterinoslav contiguous to the Donetz coal fields. This region supplies seventy per cent of the output of pig iron for European Russia, and although all the Russian ore is very easy to reduce, this ore is particularly so, and its fortunate position in regard to the coal beds nearby will probably soon make of the region one of the most important sections of Russia, and an iron famine, such as was experienced in 1913, will be made impossible. Somewhat the same happy juxtaposition of coal and iron and facilities for transportation obtain in the Altai, in western Siberia, and the temporary dearth of this valuable material will soon be overcome, and Russia will have enough and to spare.

FIG. 8.

FIG. 9.

FIG. 8—The harbor of Odessa.

FIG. 9—Emigrating to Siberia. (Photo copyright by Underwood & Underwood.)

FIG. 10.

FIG. 11.

FIG. 10—Wheat for export at Odessa. (Photo copyright by Underwood & Underwood.)
FIG. 11—Yakuts with reindeer on the Siberian tundra. (Photo copyright by Underwood & Underwood.)

Another of Russia's valuable natural resources is her petroleum. In this, America is her successful rival. Her principal oil wells, discovered centuries ago by fire worshippers, were badly injured by having water turned into them during the revolution of 1905-1906. In 1901 the output of Russian petroleum was 50.6 per cent of the whole world's product, while the American petroleum was only 41.2 per cent. The Russian production in 1901-1905 fluctuated 10 per cent, but the American production was developing more rapidly, and Russia began to lose, so that in 1913 Russia had only 18 per cent and the United States 63 per cent of the world's output of petroleum, but the export of naphtha and naphtha products from Russia reached $24,000,000 in that year.

Russia is also rich in copper, an uncomputed wealth. In this industry, America is again her more than successful rival, producing 55 per cent of the world's total output, while Russia produces only 3½ per cent. Russia uses about 4,000 tons of American copper a year—after it has been metamorphosed in Germany into lamp-burners, etc. Nevertheless, Russia has extensive copper ore in the Ural Mountains, the Caucasus, in the Altai Mountains, and in Siberia. In that part of the Urals which extends into the Arctic immense beds of copper have been discovered.

Zinc and lead are also among Russia's undeveloped resources; Poland, now in German hands, has the richest deposits, but the Caucasus is full of both metals. North of Vladikavkaz, on the northern slope of the mountains above Tiflis, large quantities have been discovered, and immense deposits of lead have been found in the sea coast region of the extreme east, north of Vladivostok.

The smelting industry, however, is still quite undeveloped, and the crude ore is very often shipped to European Russia or western Europe to be smelted.

Of precious metals and stones, Russia also has her share. The whole hem of her frontier towards the southeast and China is embroidered with gold, silver, platinum, and precious stones. In the Altai Mountains, part of the chain that closes in the Empire to the southwest of Lake Baikal, there are some of the largest gold mines of the world, surpassed only by those of California and the Transvaal, and all along the Lena River and the shore of the Sea of Okhotsk, there are vast deposits of gold. The Urals are, perhaps, the greatest treasure house, for besides the enormous quantities of metals, base and precious, which they contain, they have a wealth of beautiful semi-precious stones, clear and colorful. In Perm, a city in the Urals, a large stone-polishing industry has been developed on account of them, and here they are transformed into the most delicious and radiant drops of color.

Then there are the fisheries, the salt works in the steppes, and an infinitude of industries, big and little, taking form, most of them being established by foreigners, for the Russian very frankly says that his industrial

gift is very slight and languidly presents the samovar as the only Russian invention—an overstatement of the case perhaps, but the fact remains that for the understanding of machinery and business, he has continued to use other people's brains, so far mostly English and German. But whatever the tool Russia may choose, there is an extraordinary unanimity of belief in the greatness of her future.

Is it to come from her potential economic wealth, or from the evident genius of the Slav race? By virtue of her national landscape or from the greatness in the soul of her peasant?

To us Americans, Russia has long been an unknown quantity. Distorted expressions of her spirit have come to us from time to time, but of the conformation and content of her land we have known little and cared less. Of this one seventh of the world's surface we have remained in almost total ignorance, but now, at last, we are trying to see the whole figure of this youngest child of Europe, both spirit and form, and we find we have many mutual bonds. We both know the hunting of game and the felling of trees in the forests of the north; we both feel the pulse of our national life as the wind sweeps over the grainfields or the prairie pastures; we both have our high mountains, deep mines, and swift-flowing, full-flooded rivers. Outwardly we are much alike. But there is a difference—a very great difference. Russia is a country of age-long culture, a culture which she has preserved at the point of her bared sword, in the presence of death. We are the baby of golden-spoon fame; all conditions have combined to favor the prosperous economic development of our country. In struggling to preserve her traditions, she has been unified, and strengthened. She has lived continually in the presence of the other world. History has made Russia into a heart. We have not been knit together as a race in the face of a common foe; we have not had to suffer—history is making of us a brain. Yet, given the practically identical geographical conditions under which to live, it is only natural that we should lean towards each other and on the basis of what we share in common perhaps pave the way to an exchange of those things which we need from each other. Russia's needs are easily read: she is an all-on-land empire, and she needs railroads and more railroads; she needs machinery; she needs the organization and push in business enterprises for which we have become famous. All that side of our life could be profitably shared by Russia; and for us, besides the material gains which needs must result from such relations, will come a knowledge of the spirit which has made and kept her a great nation and which promises so much for the future. In human beings the balance between head and heart is known as genius, and something akin to genius might surely be expected from such a bond.

AËROGRAPHY, THE SCIENCE OF THE STRUCTURE OF THE ATMOSPHERE

By ALEXANDER McADIE
Harvard University

Except in its relation to aëronautics, few people appreciate the significance of upper-air exploration. It is much more than the getting of high-level temperatures, interesting as these may be. It is the prospect of a wider knowledge of the aërial ocean which lures the meteorologist. Until this work be accomplished, a man looking up at the clouds and with a map giving only surface conditions, can know no more about the sea of air above him than primitive man knew of the sea of water when he first ventured upon it. Small wonder that meteorology has made such slow progress in forty years; no wonder that weather maps seemingly alike should be followed by different conditions.

The term *aërography* is new, making its initial appearance perhaps with this article. Its meaning remains to be given; and at present we can hardly hope to do this so fully and completely that later modification will not be necessary. Like its analogues *geography* and *hydrography*, aërography, taken literally, means a description of the air. In the past four or five years the term *aërology* has been used in connection with the exploration of the upper or so-called free air; but it would seem more appropriate to let this term embrace the whole domain of atmospherics, while the word aërography might well be restricted to a description of the atmosphere at various levels. The flow and counter-flow of the air, the pressures, temperatures, humidities, dust content, electrical charge, etc., would thus be proper subjects for consideration under aërography, as well as their functions and relation to life; but such broader questions as the evolution of the atmosphere, its relation to the planet and to planetary phenomena, would be appropriately discussed under aërology.

Through the initiative of two non-official aërographers, the late Teisserenc de Bort and the late A. Lawrence Rotch, it has recently been established that the atmosphere is not of a homogeneous and uniform character but consists of two great divisions, a lower region, where temperature falls with elevation, and an upper region (in general higher than nine kilometers), where the temperature increases with elevation. The latter has been called the isothermal region, but such a name is rather misleading and should be discontinued in favor of Teisserenc de Bort's term *stratosphere*. The lower portion may appropriately be called the *troposphere*.

Pioneer but none the less excellent aërographies are "Charts of the Atmosphere for Aëronauts and Aviators," by A. Lawrence Rotch and

Andrew H. Palmer, published in 1911,[1] and the "Structure of the Atmosphere in Clear Weather," by C. J. P. Cave, 1912.[2] The introduction to the first-named volume is so brief and tells its story in such a straightforward way that we may well quote it entirely. Professor Rotch says—

"Although the exploration of the air, which was begun twenty years ago in France and Germany and at Blue Hill, was undertaken for the elucidation of meteorological problems, yet much of the data obtained is of importance for the new art of aërial navigation. Accordingly, some of the information which has been gathered by the Blue Hill Observatory in the United States and on the Atlantic Ocean through co-operation with a similar French institution, is here presented in a practical form for aëronauts and aviators. The term aëronaut is used to designate the pilot of a balloon, while aviator is restricted to the pilot of a flying-machine heavier than air.

"Thus the work which Lieutenant Maury did fifty years ago for the surface winds and ocean currents is now extended into the overlying ocean of air. This is the more necessary, since the whole aërial ocean is subject to stronger commotions than even the surface of the aqueous ocean and is navigable throughout a depth equal to that of the latter.

"The following charts, which are believed to be the first of the kind adapted to the use of airmen, relate only to portions of the United States and the Atlantic Ocean, but they will doubtless be perfected by aërologists and extended in the near future to other parts of the globe."

Cave's book is essentially an investigation of the wind currents in the light of the results obtained by sounding-balloon work in Great Britain. Certain structural types are recognized and considered in their relation to the surface wind, the gradient wind, and the general pressure and temperature distribution. The strongest air motion or wind is found just below the stratosphere; and it would seem that pressure changes originate in this region and probably control conditions throughout the lower atmosphere. We may note here the somewhat startling suggestion of Dr. W. N. Shaw[3] that wind variations may better be referred to this upper level than to the surface. Cave is of the opinion that such a base simplifies the problem. For example, working downward, he finds[4] that in a certain ascent (Sept. 15, 1911) the west-east component of air flow decreased from +32 m/s. (meters per second) at a height of 9 kilometers to —8 m/s. at 1 kilometer. This means that the *flow was reversed with approach to the earth's surface.* Similarly the north-south component decreased from +12 m/s. to —10 m/s.

Aërographers, then, may well begin their work with these two volumes by Rotch and Cave. If the titles sound somewhat strange to our ears let us recall the quaint expression used by the Dorset squire, Robert Boyle,

[1] 24 full-page charts, with descriptions. John Wiley & Sons, New York, 1911. (Review in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 861-862).

[2] xii and 144 pp. University Press, Cambridge, 1912. (Review in *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, p. 62.)

[3] *Quart. Journ. Royal Meteorol. Soc.*, Vol. 38, 1912, pp. 46-48, and *Nature*, Vol. 88, 1911-12, p. 141.

[4] *Op. cit.*, p. x.

in his book published in 1660, entitled "The Spring of Air." This volume undoubtedly marks the beginning of positive knowledge regarding the physical processes of the atmosphere, for, crucial as were the experiments of Torricelli, Pascal, and von Guericke, it was Boyle who showed us that the air was elastic; and his law of pressure and volume relation, expanded later into the characteristic equation of a pure gas, lies at the bottom of our modern thermodynamics.

We shall appropriate the term "structure" from Cave, for aërography must be, in essence, a description of the structure, or make-up, of the atmosphere. But every structure must rest upon a base; and in aërography it may be necessary to discard the old sea-level plane so familiar to us, but now known to be of somewhat doubtful value, when atmospheric conditions over continental areas are to be reduced downward. How can we get another base plane? It may be remarked at this point that it is a difficult matter to adequately represent atmospheric conditions on a flat map. The daily weather map in its present form—and there has been practically no change in forty years—by no means represents conditions at the bottom of the ocean of air; and perhaps much of the uncertainty of forecasting may be traced to faulty graphics. Again, the aërographer must be able to show on the base not only pressure and temperature gradients, but water-vapor content and, for lack of a better name, dust load, meaning thereby small and large nuclei of condensation, ions, and electrons. And it will be a great step forward when these can be shown for all levels. Then, as a geographer would chart continents, coasts, and islands, the aërographer would chart hyperbars and infrabars—regions of excessive air flow and regions of no flow or stagnation—also levels where the interchange of air was mainly by "advection," or horizontal motion, and where the interchange was by "convection," or vertical motion, using terms introduced by Ernest Gold in his prize essay on "The International Kite and Balloon Ascents."[5]

With such a base map and such auxiliary charts the winds and clouds will take on a new significance and can be studied to advantage. The layman as well as the expert would be able to follow the general circulation, and follow intelligently the average west-to-east drift around one pole and the reversal at the other. Interruptions and displacements of the great air streams could be correlated with abnormal weather conditions and give us firmer ground in forecasting. At present one must applaud rather the valor of the forecaster than the value of the forecast. Such charts would go far in settling discussions regarding the origin of cyclones and anticyclones, discussions which, so long as they are based upon present charts of air flow, must continue to be unsatisfying.

Returning again to the apparent structure of the atmosphere: As indicated by the models used by Cave, it would seem to be entirely feasible to

[5] *Geophysical Memoirs No. 5* (= pp. 61-144) Meteorological Office, London, 1913. Reference on p. 109.

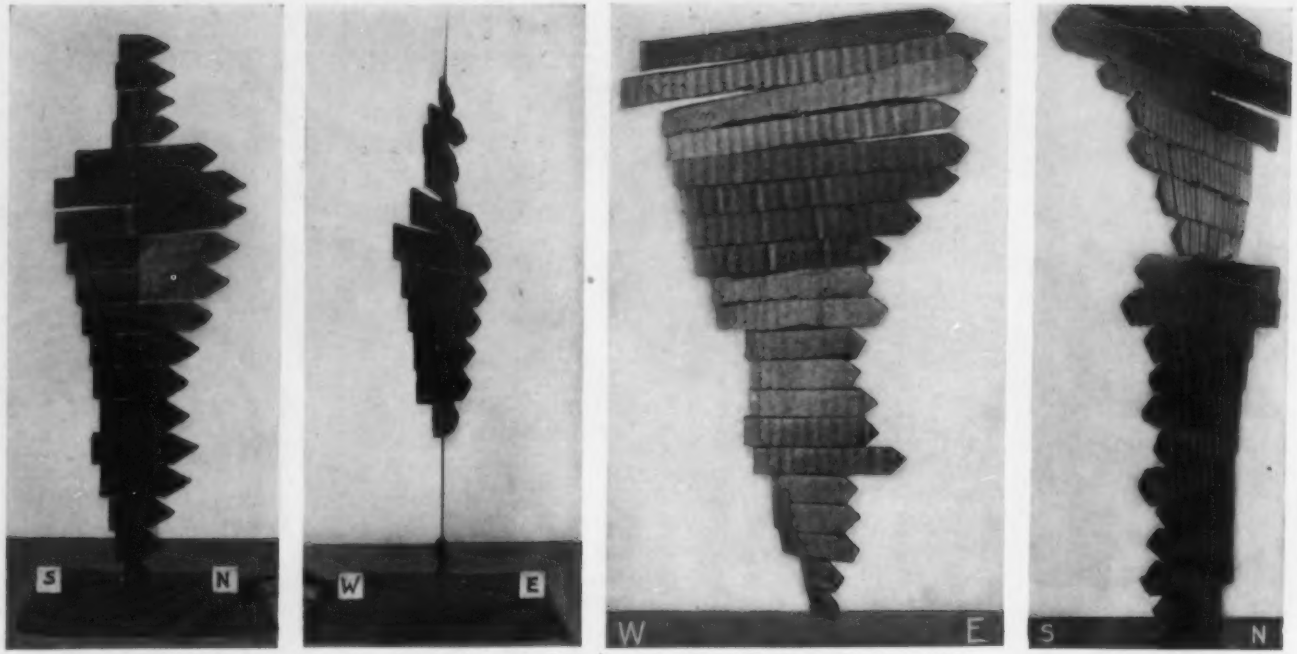
show the sequence of wind velocities and directions at various levels appropriate to certain types of weather and certain seasonal conditions. Let us also consider Shaw's suggestion of the stratosphere as the principal plane of reference. It may seem strange to attempt to use so variable a level as the base of the stratosphere, yet it may be after all most appropriate, since the atmosphere is itself variable and mobile. The geographer deals with a solid earth, and there is no flow horizontally or vertically. True, we live upon a rotating geoid; but our sensations and impressions are such as would be common to dwellers upon a flat surface. We are handicapped in comprehending air motion because all our experiences are based upon impressions of level and fixed planes. We are, for example, absolutely unconscious of any deflective effect of a moving air current due to the earth's rotation.

It is a peculiar fact about the stratosphere and one full of significance that it does not remain at a fixed height but varies with season and latitude. At the equator, as we rise in air, the temperature continues to fall to a much greater height than in temperate latitudes. Indeed the lowest temperature, probably the lowest natural temperature, is found above the equator. This state of affairs was anticipated by Teisserenc de Bort and Rotch and has now been proven by certain ascensions. Thus at Batavia, Java, on December 4, 1913, the sounding balloon reached a height of 26 kilometers, entering the stratosphere at 17 kilometers and recording a temperature of 192° A (—112°F). In other words, the stratosphere is highest over the equator and lowest over the poles, so far as we know.

Expression of air flow, then, is the first desideratum in aërography. The aërographer, however, is at present in something of the quandary in which a geographer would be who depended upon a scale of distance that could be applied only in one direction. A map based on such coordinates is, of course, of limited value, and this is true in aërography if we measure only horizontal and not inclined and vertical flow.

Investigators have been singularly slow in measuring and expressing air flow. Records of horizontal flow date back to the middle of the seventeenth century, or rather began about that time in Italy; but the measurement of vertical flow is still wanting, although W. H. Dines emphasized the need in 1887 and gave us a new form of anemometer. The whole series of wind measurements made in various official weather services throws little light on the vertical movement of the air. And what is still more disheartening, there is a very large error in the horizontal velocities as published.

It is of the utmost importance that we know something or have some way of representing the vertical component of motion of the air. The formation of rain, local and general air drainage, pressure gradients, and temperature gradients are affected by the duration and strength of ascensional and descensional currents. In aëronautics, too, this matter is important.



FIGS. 1 to 4—Models representing vertical wind distribution.

Figures 1 and 2 represent the conditions at Ditcham, Hampshire, England, on October 1, 1908; Figures 3 and 4, the conditions at Blue Hill Observatory, Mass., on August 12, 1910. Each model is shown from two sides (Figures 1 and 4 from the east, and Figures 2 and 3 from the south) so that the orientation of the arrows may be seen. The arrows fly with the wind; the length indicates the velocity at that level. In Figures 1 and 2 each arrow represents an air stratum of 1,000 meters and in Figures 3 and 4 of 500 meters.

Figures 1 and 2 are taken from Cave's "The Structure of the Atmosphere in Clear Weather," 1912. Figures 3 and 4 are from models based on soundings made at Blue Hill Observatory.

In a recent paper[6] we find the conclusion that on cloudless days the average upward velocity at the given point was about 0.5 meter per second, while on days with detached cumulus clouds the average velocity was about 2 meters per second.

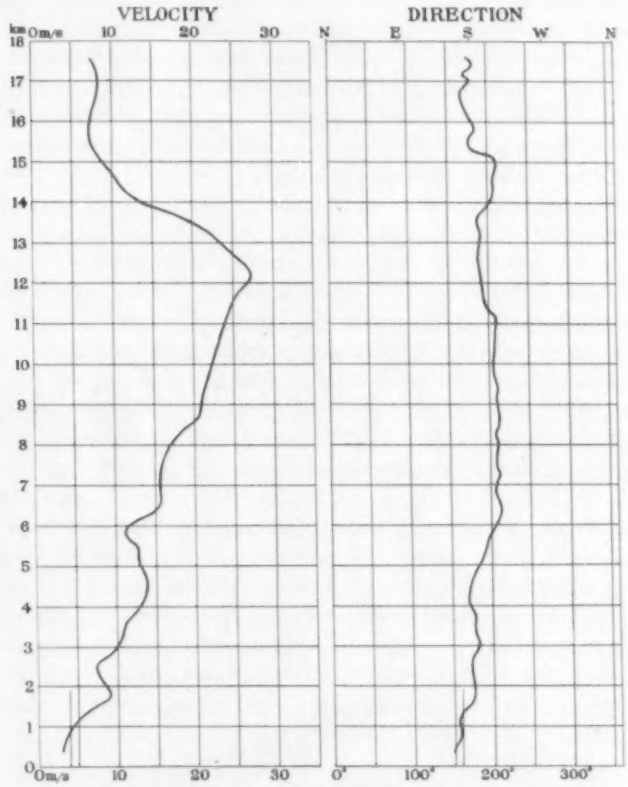


FIG. 5—Diagram showing, for the wind conditions at Ditcham, England, on October 1, 1908, represented by the model of Figures 1 and 2, the relation of velocity and direction to height. Based on a figure in Cave's "The Structure of the Atmosphere in Clear Weather," 1912.

The sounding balloon was watched until it burst, and the highest point deduced from the meteorograph trace was used as the highest point for wind observations; up to 4 kilometers the wind observations were deduced from the two-theodolite method; above this the balloon was supposed to have a uniform acceleration up to the highest point reached, and the wind velocities were calculated on the one-theodolite method.

But the running of the air—to translate literally the old Greek definition of wind—is not a steady, uniform, and continuous motion. On the contrary the flow is frequently of an intermittent character. There are lulls and gusts; and there are eddies and vortices, small and large. This uneven-

[6] Report on Wind Structure No. 4 (for 1912-13): Papers by J. S. Dines. Meteorological Office, London, 1914.

ness of flow was brought out clearly by Professor S. P. Langley in his paper on "The Internal Work of the Wind."[7] In the light of present achievements in aviation it is interesting to read his statement, which seemed so fantastic when written, that an indefinite source of power for the maintenance of mechanical flight might lie in this unevenness of flow, which he called the internal work of the wind. And he adds, what is of some importance in aërography, that "the actual effect of the free wind, which is filled with almost infinitely numerous and incessant changes of velocity and direction, must differ widely from that of a uniform wind such as mathematicians and physicists have almost invariably contemplated in their discussions."[8]

In order to illustrate with more detail the structure of the free air as determined by modern soundings, we have borrowed from Cave's book one of the many models shown (Figs. 1 and 2). This represents the wind distribution on October 1, 1908, seen from the east and from the south. The greatest height in this case was 17.6 kilometers. The diagram (Fig. 5) shows the relation of wind elements to heights.

The structure indicated by Figures 3 and 4 is that of a typical midsummer fair-weather day on the New England coast. There was no sea breeze nor even the northeast inflow found frequently under anti-cyclonic conditions. The structure is exceedingly uniform. In the lower strata the velocities average from 2 to 6 meters per second, and the flow is fairly steady in direction horizontally. There is a tendency to shift to the north up to about 2,800 kilometers, then an increasing westerly component. The sky was practically without clouds. An extensive high area moving east at a normal rate overlay the eastern half of the United States. In the Ohio Valley and Lake Region the pressure ranged from 1,020 to 1,025 kilobars. The twenty-four hours following were without rain in Ohio, Pennsylvania, New York, and New England. In fact the day was a typical fair day, and the structure may be said to indicate a certain stability and absence of turbulence.

In general the sub-stratosphere is the region of maximum air motion. Again, the modification of wind direction seems to progress downward. Perhaps I can not do better than sum up the impression which such models of structure give than by quoting the words of Dr. W. N. Shaw:[9]

"It appears that we must regard the sub-stratosphere and the regions above as the dynamical laboratory of the atmosphere, where the main causes of pressure changes originate, and the troposphere beneath the sub-stratosphere as the physical laboratory of the atmosphere, where cloud, rainfall, and other physical phenomena are produced by local causes,

[7] *Smithsonian Contributions to Knowledge*, Vol. 27, No. 2, Washington, 1893. 23 pp.

[8] Langley Memoir on Mechanical Flight, *Smithsonian Contributions to Knowledge*, Vol. 27, No. 3, Washington, 1911. 320 pp. Reference on p. 42.

[9] The Free Atmosphere in the Region of the British Isles: Second Report. By W. H. Dines, with a preface by W. N. Shaw. *Geophysical Memoirs No.* 2 (= pp. 11-50), Meteorological Office, London, 1912. Reference on p. 22.

induced, in some cases, by the effect of the dynamical changes in the upper regions."

Thus far we have laid stress on the flow of the air. But temperature and other data are also available. Thus W. H. Dines[10] has given us the normal isopleths of temperature and also pressure from sea level to a height of 20 kilometers and curves showing the local difference from the mean temperature for each level. The Geophysical Institute of Leipzig, under the direction of V. Bjerknes, is publishing a series of synoptic charts for three-day periods of the year 1910 showing the conditions at different levels.[11]. The atmosphere is divided into ten principal isobaric levels. In the last number issued, representing the period August 8, 9, and 10, 1910, the stations furnishing soundings were Trappes near Paris, Uccle near Brussels, Pyrton Hill near London, Crinan near Glasgow, Oughterard on the west coast of Ireland, Manchester, Pavia, Friedrichshafen on Lake Constance, Strassburg, Hamburg, Lindenberg near Berlin, Vienna, Pavlovsk near Petrograd, Nijni-Oltchedaeff in southwestern Russia, and Munich. There were also auxiliary cloud observing and mountain stations. With the data for these stations we can at once construct over Europe the heights in dynamic meters for each stratum of 100 kilobars and also what may be called the relative topography, i. e. the value in dynamic meters between each successive level, or, in other words, the gradient for the aërographic topographer.

Thus the making of aërographic surveys is already under way. Perhaps the day is not so far distant when charts of air structure will be available for consecutive tri-hourly periods for the use of aviators and aërial engineers, for the time is rapidly approaching when problems of transportation via air routes must be considered.

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[10] *Op. cit.* sub 9, p. 29.

[11] Synoptische Darstellungen atmosphärischer Zustände: Jahrgang 1910. *Veröffentl. des Geophys. Inst. der Univ. Leipzig:* Heft 1, Zustand der Atmosphäre über Europa am 6. Januar 1910 (Leipzig, 1913); Heft 2, —— am 2., 3. und 4. Februar 1910 (Leipzig, 1913); Heft 3, —— am 18., 19. und 20. Mai 1910 (Leipzig, 1914); Heft 4, —— am 8., 9. und 10. August 1910 (Leipzig, 1915).

THE NICHOLS MO-SO MANUSCRIPT

By BERTHOLD LAUFER, Ph.D.
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That charming book, "Through Hidden Shensi," made the late Mr. Francis H. Nichols widely known to the public, but few are acquainted with his high aspirations in attempting to acquire the Tibetan language by leading a solitary life for a considerable time in the lama monastery of Wei-si in the prefecture of Li-kiang, Yün-nan Province.[1] On arriving at Mandalay, Burma, on September 20, 1904, he sent the following note: "My greatest treasure I enclose. It is a book in the Ton-ke, the original language of the Mo-so tribe, who now speak and write Tibetan. Books like this one are exceedingly rare and difficult to obtain. I consider myself fortunate in having secured this manuscript. Part of it I have been able to translate."

It is a pleasure to respond to the request of the American Geographical Society for some comment on this rare and valuable Mo-so manuscript which he presented to the Society. The designation Ton-ke, which is used by Mr. Nichols, is composed of *ton*, or what other travelers style *tong-pa*, the name for the shamans, or sorcerers, of the Mo-so, and the word *ke* (Tibetan *skad*, pronounced *kä*), which means "language." The hope that the partial translation of the manuscript might be preserved has unfortunately not been fulfilled. Mr. Nichols' mother, Mrs. William C. Nichols, of Evanston, Ill., states that this translation has not been found in his papers, or has never reached her.

At present the Mo-so inhabit the Chinese prefectures of Li-kiang and Ho-k'ing in the province of Yün-nan. They represent the remnants of a once powerful and more extended tribe (or even several tribes), which belong to the Tibeto-Burmese stock of the large Indo-Chinese family. Their idiom, as far as we can judge at present, shows decided affinities with Tibetan and Lo-lo; it is, however, not merely a Tibetan dialect, but an independent language with peculiar characteristics. The name Mo-so is applied to them by the Chinese and presents the combination of two tribal names, Mo and So. They style themselves Na-shi, and are called by the Tibetans Jang. The latter term appears in Kara-jang, the medieval designation for the province of Yün-nan, applied to the latter by Marco Polo and the Persian historian Rashid-eddin.

For all that we know thus far about the history of this people we are indebted to the records of the Chinese. The Mo-so are first mentioned under the T'ang dynasty (608-916). Toward the end of the eighth century they

[1] An account of lamasery life at Wei-si from Mr. Nichols' diary was published in the *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 100-114, where further details of his travels in China may be found.

were subjugated by Yi-mou-sün, ruler of the kingdom of Nan-chao in Yün-nan, which was composed of members of the Tai or Shan stock, the ancestors of the subsequent Siamese. Under the Sung dynasty, Mong-ts'u, the chief of the Mo-so, captured the town of Li-kiang. The Mongols, after their conquest of Yün-nan, established two departmental districts in the Mo-so territory, called Tsaghan-jang and Kara-jang, that is, "White and Black Jang."

In former times the Mo-so were very warlike tribesmen, fighting many a battle with their Tibetan neighbors, and were even bold enough to invade the southeastern portions of Tibet. The memory of this heroic age is preserved in the great national epic poem of the Tibetans, the Gesar Saga, divided into three sections, one of which is devoted to the struggle of the Tibetan warriors with the Mo-so.

There is a Chinese chronicle devoted to the history of the chiefs of Li-kiang, who from the year 1382 bore the family name Mu. This work has been translated and interpreted by E. Chavannes.[2] It contains an interesting genealogy of the Mo-so chieftains from the beginning of the twelfth to the first part of the seventeenth century. To the industry of P. Cordier, the eminent bibliographer of the literature relating to Eastern Asia, we owe an excellent summary of what has been written on the Mo-so.[3] This study also contains a Mo-so vocabulary.

What renders the Mo-so particularly interesting is a peculiar pictographic system of writing and a religious literature composed in it and extant in a number of manuscripts. T. de Lacouperie, the versatile orientalist, was the first to take an interest in this matter and to publish facsimiles of two Mo-so manuscripts procured by Captain W. Gill and Father A. Desgodins.[4] He made several very ingenious observations on the script, but owing to lack of information he was unable to make a statement as to the contents of the manuscripts. The beginning of the same manuscript acquired by Desgodins was reproduced also by G. Devéria,[5] likewise without explanation. Prince Henri d'Orléans brought back five Mo-so manuscripts from his journey in 1895-96 and figured the first three pages of two of them, accompanied by a translation and transcription of one of the texts.[6]

The first scholarly contribution to Mo-so literature was made by Monsieur Charles-Eude Bonin, at present Consul-General of France in Montreal, Canada.[7] In 1895 he was charged with a mission along the borders of

[2] Documents historiques et géographiques relatifs à Li-kiang, *T'oung Pao*, 1912, pp 565-653; also reprinted in the work of J. Bacot: Les Mo-so, pp. 127-215 (Leiden, 1913).

[3] *T'oung Pao*, 1908, pp. 663-688 (compare also his article on the Mo-so in *Journ. des Savants*, 1911, pp. 129-134).

[4] T. de Lacouperie: Beginnings of Writing in Central and Eastern Asia, pp. 45-50, Plates I-III (London, 1894). The manuscripts were first published in the *Journ. Roy. Asiatic Soc.*, 1885.

[5] La frontière sino-annamite, p. 166 (Paris, 1886).

[6] In his book "Du Tonkin aux Indes," pp. 364-367.

[7] Note sur un manuscrit Mosso, *Actes du onzième Congr. Intern. des Orientalistes*, 2d section, pp 1-10, Paris, 1898. This article is reprinted and generally accessible in the author's book "Les royaumes des neiges: États himalayens," pp. 281-296 (Paris, 1911).

Tibet and had the opportunity of traversing, as the first white man, the territory of the Mo-so. He visited also its capital, Li-kiang, and was fortunate enough to secure a Mo-so manuscript from a native priest, a so-called *tong-pa* (in Chinese, *to-pa*). The latter are the shamanistic sorcerers representing the aboriginal form of religion that obtained in times prior to the introduction of Buddhism among the Mo-so people from Tibet. A certain affiliation still exists between the Buddhism of Mo-so land and the Lamaist church of Lhasa. Capable Mo-so men are recruited by the Tibetan lamas for the ecclesiastic army and sent to Lhasa in order to receive the benefit of a religious and theological education. Despite this official conversion to Buddhism the adherents of the primitive native religion still hold their ground, and it is their principal ritual that is contained in the book secured by M. Bonin. The poor *tong-pa* who transmitted it to him secretly made a translation of the first six pages into Chinese, which was recorded by a Chinese interpreter, and it is on this Chinese version that M. Bonin's French rendering is based. The original manuscript, unfortunately, is not reproduced by him, but we trust that M. Bonin, in the interest of science, will be induced to publish it in the near future. The description given of the manuscript shows that in its technical make-up and appearance it comes very near to the manuscript of Mr. Nichols. Like the latter, it is an album of oblong size, comprising twelve folios of very strong paper, the verso and recto of each leaf being inscribed, save the last page, which is decorated with designs of red flowers. The two sides of the first folio are occupied with representations of deities and objects of the cult. The ten following folios are covered with colored hieroglyphs peculiar to the writing of the *tong-pa*, and on each page distributed over three horizontal lines, each line being divided by vertical strokes into two or three sections. These form a series of rectangular enclosures, the characters of each quadrangle representing a phrase, so that the vertical lines assume the function of our punctuation. M. Bonin insists on the strictly hieroglyphic character of Mo-so writing, saying that nearly all characters directly picture the object for which they are intended. Likewise he lays emphasis on the indigenous origin of the system, which appears not to contain any elements borrowed from the script of the Lo-lo or the Chinese. The notable foreign elements seem to him rather to be derived from India, as, for instance, the design of the svastika, which is expressive of the idea of bounty. According to the vocabulary of J. Bacot[8] the symbol of the svastika would mean a "remedy." The manuscript of M. Bonin is the only one thus far known in which pigments are applied to the characters: that of Mr. Nichols and all others are written exclusively in black Chinese ink, and, apparently, not with a brush, but by means of a pointed wooden stylus, such as is in vogue among all present Tibetan tribes and as was employed also by the ancient Chinese in times prior to the invention of the writing-brush. In

[8] Les Mo-so, p. 103.

the Bonin manuscript the colors seem to bear out a symbolic significance, the idea of "earth," for instance, being conveyed by a blue band covered with bunches of grass.

It is difficult to form an opinion on the translation of the Mo-so ritual, as it is offered by M. Bonin. He himself admits that it should not be regarded as definite, but simply as an essay to make out a coherent concept of the ideographic characters, which merely convey notions of realistic objects without being capable of expressing the verb. A great antiquity is ascribed to his text, regarded as the product of indigenous religious thought, the original being traced to an epoch when the Mo-so were not yet in contact with Chinese or Mongols, and under their chief Mong-ts'u conquered the territory of Li-kiang. This conclusion is tempting, but it can be accepted only with certain strictures. First of all, the Indian-Buddhist influence transmitted through the medium of Tibet is quite apparent in this brief text, as particularly shown by the thirty-three spirits of heaven, which are mentioned twice. Every one familiar with Buddhist literature knows that these are the thirty-three gods, headed by Indra, of the Brahmanic heaven. Among the offerings made to the gods by the family we note "tobacco," and this is a recent element giving rise to suspicion. To be sure, it may be a subsequent interpolation smuggled into a text of older date, but a sacred ritual that is thus impaired and modernized can hardly lay claim to that purity of native atmosphere with which it is credited.[9] Be this as it may, the great merits of M. Bonin as a pioneer worker in the field of Mo-so literature remain uncontested.

An essential progress in the advance of Mo-so studies is signaled by the recent work of J. Bacot.[10] This energetic traveler and explorer has made not only most interesting contributions to the life and religion of the people but has furthered a great deal also our knowledge of their language and systems of writing. He is the first to have revealed the interesting fact that the Mo-so have not, as had hitherto been believed, merely one system of writing, but that they have at least two. Besides the pictographic method there is a syllabic script; and the latter, again, appears in combination with the former, as the Japanese combine the syllabary of their Katakana or Hiragana with the Chinese characters. In its style and outward appearance the marks of the Mo-so syllabic system bear a certain resemblance to

[9] Among the many curiosities of the Tibetan-English Dictionary, published in 1902 by Sarat Chandra Das, the well-known Bengali student of Tibetan and explorer of Tibet, we read (p. 565) that the evil drug tobacco (in Tibetan *tha-ma-kha*) appeared in ancient time about one hundred years after the death of Buddha, which would yield the date 377 B. C., and that mention is made of tobacco also in the writings of a lama who is dated in the twelfth century A.D. In 1908 I enjoyed the privilege of spending several months in "Lhasa Villa," the house of Das in Darjeeling, and when one evening, in the course of a learned conversation with him, I ventured to draw his attention to this chronological anomaly and the post-Columbian introduction of tobacco into Europe and Asia, he replied, "This is your tradition, and that (pointing to the passage in his dictionary) is our tradition; and our traditions certainly are as good as yours."

[10] Les Mo-so: Ethnographie des Mo-so, leurs religions, leur langue et leur écriture, par J. Bacot. Avec les documents historiques et géographiques relatifs à Li-kiang par E. Chavannes (Leiden, 1913, 41 plates and a map).

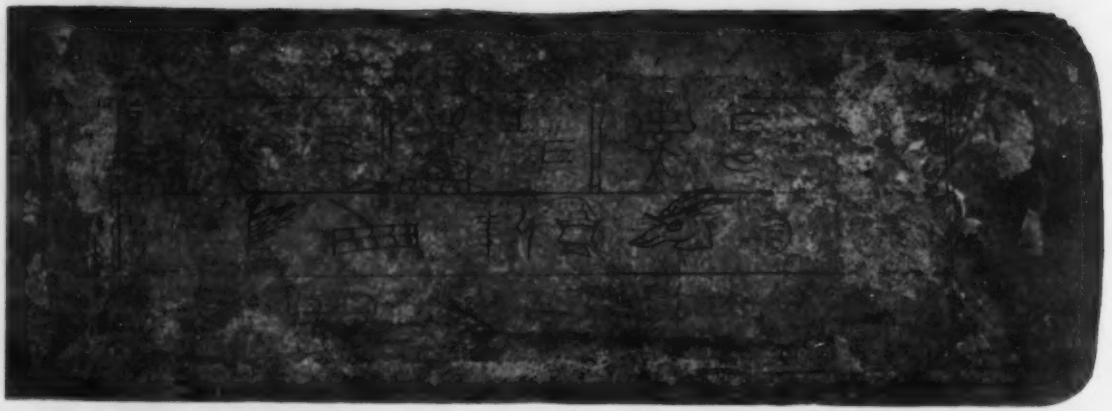


FIG. 1.

FIG. 2.

The Mo-so manuscript of the American Geographical Society. (Size of original, 28.3 x 9.7 cm.)
FIG. 1—Title-page (page 1). FIG. 2—Verso of the first folio (page 2).

FIG. 3.

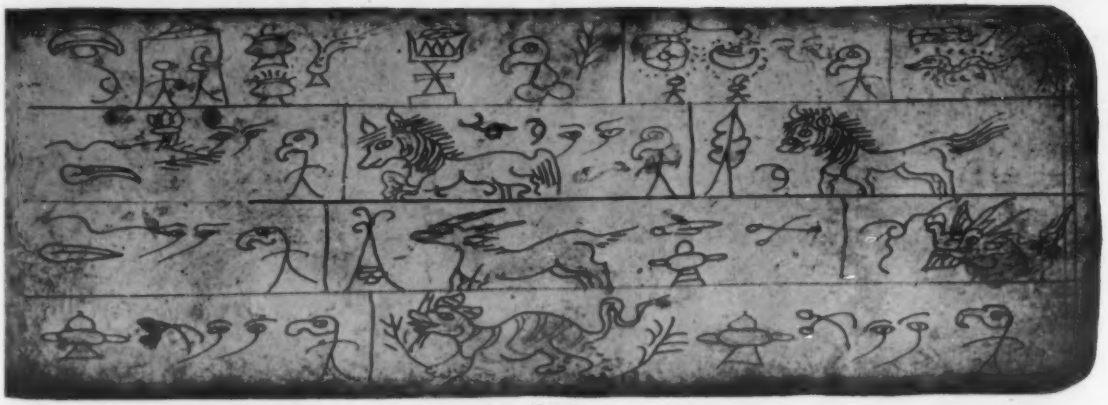


FIG. 4.

FIG. 3—Recto of the second folio (page 3).

FIG. 4—Recto of the fifth folio (page 9).

the Önmun alphabet of the Koreans; and the reason presumably is that, like the latter, it may be traceable to the Indian Devanāgarī or an allied alphabet.[11] It is needless, however, to speculate on this point, as we are ignorant at present of the origin and history of the Mo-so syllabary. M. Bacot has published seven plates containing so-called Dhāranī (mystic prayer forms, spells, and charms) composed in this style of writing; and if the syllabary is with predilection chosen for this class of Buddhist literature, we may presume with some degree of probability that this script received its impetus from India. On pages 68-117 of his book a very useful list of Mo-so words is given with their pictographic and syllabic characters. As a foundation it is excellent, though it is certainly not complete, as we meet in the Mo-so texts numerous characters not yet explained. Our knowledge of the Mo-so grammar being only of the most rudimentary kind (the dictionary remains as yet to be made), it is impossible to decipher Mo-so manuscripts at home in the study. Such researches, naturally, can be pursued only in the field, in the midst of the Mo-so, with the assistance of native scholars or learned priests. It is hoped that some of the French missionaries who applied themselves so successfully to the study of the Lo-lo will soon attack also the Mo-so problem.

As regards the origin of the pictograph system of writing, M. Bacot reiterates the very interesting theory which had already been advanced by T. de Lacouperie.[12] He supposes that it is identical with the script which is said to have been in vogue among the Tibetan shamans prior to the seventh century. Forgotten in Tibet, it would have survived among the Mo-so, while its traces may still be recognized in certain pictorial charts employed by the Tibetans for purposes of magic. It is very likely that the realistic and partially conventionalized designs now serving the expression of ideas were in their origin religious symbols utilized in magic rites and devil exorcisms, or even purely ornamental motives. Certain it is that, in the same manner as the peculiar writing of the Lo-lo, the pictographs of the Mo-so bear no relation to those of the Chinese and are entirely independent in their origin and development. The Chinese Chronicle of Li-kiang relates that Nien-pao A-tsung, the son of the ancestor of the Mo-so chiefs, invented a system of writing for his country in the twelfth century, but we are left in ignorance as to what this writing was.

The Mo-so manuscript of Mr. Nichols consists of nine oblong folio leaves, measuring 28.3 x 9.7 cm. and sewed together on the left-hand margin by means of treble yellow-silk threads. The peculiar size is derived from that of Tibetan books, which, on their part, imitate the palm-leaf manuscripts of India. The writing, done by means of black Chinese ink, is apparently accomplished with a bamboo or wooden stylus. The paper is stiff and heavy and has assumed a yellowish brown color. Dr. C. F. Millspaugh, Curator

[11] Compare W. G. Aston: Writing, Printing, and the Alphabet in Corea, *Journ. Roy. Asiatic Soc.*, 1895, p. 510.

[12] Beginnings of Writing, p. 48.

of Botany in the Field Museum, who has a wide experience in the study of Oriental papers, has been good enough to examine the paper of this manuscript, with the following result: "The paper employed in the fashioning of this book," he remarks, "is manufactured from the bark of *Streblus asper*, a rigid shrub or small, gnarled tree, belonging to the same botanical family (*Moraceae*) that includes the paper mulberry. The tree is found in the dryer parts of India from Rohilkhand eastward and southward to Travancore, Penang, and the Andaman Islands. It is prevalent also in Cochin-China, Siam, and the Malayan Islands. In Siam it forms the pulp for the famous *Laos* paper. There the bark is known as *Khoi* bark. In Siam the bundles of bark are soaked in water for two days, then steamed with lime for the same period, shredded, placed in earthen jars and steeped in clear water and lime for a few days, washed free of lime, beaten to a pulp with wooden mallets, floated in water where the flakes of unmacerated bark and knots are picked out, and finally floated out, squeezed, and layered into the thickness desired for pressure and drying into paper."

Four pages of the manuscript, which consists of nine folios of two pages each, are reproduced herewith.[13] The title of the work is written in the center of the front cover (Fig. 1), occuying two lines enclosed by rectangles, the symbols running from the left to the right, as is the case also in the Tibetan alphabet.

The verso of the first folio (Fig. 2) contains three mythological representations which stand outside of the frame of the text proper, that begins with the second folio. They are, so to speak, miniatures intended as book-decoration and selected with due regard to the contents and purport of the book. As will be seen, they even afford an important clue to reveal to us its subject-matter. The idea of placing miniatures in front of the book is borrowed from the Tibetans, who on their part have been inspired by traditions inflowing from India. The Lama artists are masters in the execution of exquisite miniature painting in colors,—gold, silver, or black,—spread over the covers or the pages of a book. The animal on the left-hand side of the Nichols manuscript is a tiger, well characterized by the shape of the head and the stripes of the skin. This identification is confirmed by a note of Mr. Nichols himself, who has accompanied it with a pencil-mark reading *tag*. The latter word (written *stag*) is the general Tibetan designation for the tiger and probably is also the corresponding Mo-so word for it.[14] In the shamanism of Tibet (as well as in the shamanistic religions of Siberian peoples, particularly the Amur tribes) the tiger plays the rôle of a powerful deity. The central figure of Figure 2 represents a subject of purely Indian mythology, the bird Garuda, the companion and riding-beast of the god Vishnu. He is the inveterate enemy of the

[13] Students desiring more information may consult the manuscript in the Society's library.—EDIT. NOTE.

[14] M. Bacot (*loc. cit.*, p. 108) gives *la* as the Mo-so term for the tiger, which is also the word of the Lo-lo. D'Ollone (Langues des peuples non chinois de la Chine, p. 64, Paris, 1912) gives the Mo-so word in the form *ta* which is the same as Nichols' *tag*.

serpent-demons, the Nāga, and constantly engaged with them in a struggle of destruction. The Mo-so representation is perfectly in accordance with, indeed, an exact reproduction of what we meet in Tibetan art, and familiar to all students of Tibetan iconography. The bird is outlined *en face* with outspread wings, soaring above the clouds, with triangular hooked beak, seizing in its claws a snake whose head droops toward the left. The Nāga is an inhabitant of the water, and accordingly we see a sketch of wave-lines along the lower margin, being symbolic of the watery element. The Garuda is supposed to have wrested the Nāga from its abode; and the latter, as indicated by the downward position of its head, makes a supreme effort to be restored to its former home. Mr. Nichols has made here a pencil-note "phœnix," which may be an erroneous explanation given by his Chinese interpreter.

The most interesting of all is the figure on the right-hand side of this page. We note what appears as a male deity clad with a panther's skin and boots of Chinese style, and crowned with a five-lobed diadem. He stands with straddling feet over a nude figure which lies on its back. In his right hand he brandishes a rattle-staff (known in Sanskrit as *khakkara*), and in his left a tambourine (*damaru*) or cymbal. This figure is well known as that of the great Indian magician Padmasambhava, the "lotus-born," who introduced a degenerate form of Buddhism into Tibet toward the middle of the eighth century. He conjured and overpowered the native demons but assimilated all of them to the pantheon of Çivaitic gods, which he introduced. He became the founder of a sect known as the Old Church, in distinction from the subsequent Reformed Church, organized by Tsong-kha-pa. The later generations canonized him as the most efficient saint and the second Buddha; and the common people, particularly of Sikkim and eastern Tibet, still worship him directly as a god. An immense literature, written in Tibetan and Lepcha, has crystallized around this interesting personage: a bulky biography, teeming with miracles and romantic adventures, and numerous other books have been produced in his honor. Only a small fraction of these works has thus far been made accessible in translations: E. Schlagintweit, A. Grünwedel, and the present writer have contributed several monographs to the subject.

In the work of J. Bacot (Pl. xvi) we find the reproduction of a Mo-so painting representing the same personage. He occupies the center of the picture, being surrounded by four smaller effigies of himself, differing solely in the posture of the hands and feet. Beneath we see a tiger facing a bull, the two being separated by a censer from which burning incense flames up and on which six death's heads are figured. On the top is shown a Garuda standing in clouds and holding a serpent in its beak and between its claws. This picture, accordingly, comprises all essential elements contained on the inner title-page of our Mo-so book. M. Bacot has termed this image Tumbashera, who, according to him, is identical with Sherab-

mi-vo, the mythical founder of the Tibetan Bon sect. As seen also by M. Bacot, however, the Mo-so legends connected with Tumbashera contain vestiges of the Buddha legend (as, for instance, the story of his birth from his mother's armpit), and, on the other hand, show a strong resemblance to the tradition of Padmasambhava. The case is such that the whole Buddha legend has been plagiarized and transferred to the revered saint Padmasambhava. The Tibetan people in general do not care much for the life of Buddha, but they are keenly interested in that of his prophet; and thus the conclusion is justified that also the Mo-so, who are surrounded by Tibetan tribes adhering to Padmaism rather than Buddhism, are driven to the same tendency. There is positive evidence forthcoming from the Nichols manuscript for the fact that this book deals with a legend taken from the cycle of Padmasambhava: it is adorned with his portrait on the page preceding the text, and this is a safe criterion to warrant the conclusion that the text can have only Padmasambhava as its subject. If therefore his portrait, as assured by M. Bacot, is styled Tumbashera by the Mo-so, this would mean that Tumbashera is the Mo-so designation for Padmasambhava. Thus the not unimportant result is assured that the Nichols manuscript represents a chapter or a story from the legendary biography of this saint, a book celebrated all over Tibet and Mongolia.

It is evident also that many other Mo-so manuscripts are nothing but detached chapters from the same work in Mo-so translation. To these belongs the manuscript published by T. de Lacouperie,[15] as proved by the image of Padmasambhava outlined in the beginning of the first page. Here, in correspondence with numerous Tibetan statues and paintings, he holds in his left hand a skull-bowl supposed to be filled with blood. The title of the same manuscript opens with the well-known Indian design of a lotus-blossom surrounded by leaves, and it is plausible that it may express the first element of the name of the great saint, *padma*, the "lotus." The technique and the style of writing of this manuscript are exactly the same as those of the Nichols book. Also M. Bacot's manuscript[16] manifestly comes from the same source. It is, however, not complete, or not completely illustrated, only four pages being reproduced. The first page, at least, is missing; and the long legend given in translation on pages 18-20 of his work obviously corresponds to far more than four Mo-so pages with only sixteen short lines.

The specific Buddhist contents of Mo-so literature are strongly borne out by the Buddhist images and emblems with which the manuscripts are adorned: M. Bonin has encountered in his manuscript a sketch of the Buddhist lion, further the traditional picture of the Bodhisatva Avalokiteçvara, and to his right the design of the conch-shell trumpet, an ancient symbol of the Buddhist church, the call of which still summons the lamas

[15] Beginnings of Writing in Central and Eastern Asia, Pls. i and ii.
[16] Les Mo-so, Pls. xviii and xix.

to their prayer-meetings. Finally, what M. Bonin describes as "the chief of the evil genii, whose robe, head-dress, and boots remind us of those still worn by the itinerant lamas of Tibet," in my opinion, can be nobody but Padmasambhava. In the title-page of de Lacouperie's manuscript we note, besides the lotus above referred to, the symbol of the so-called *çrīvatsa* ("lucky knot"), the mystic emblem of the god Vishnu and his adherents.

The second folio of the Nichols manuscript (Fig. 3) opens with a design of waves common to the art of the East in general. It fulfills a purely ornamental function; likewise the following spiral pattern, which is very frequently found in the beginning of Tibetan books. The first symbols are the sun and the moon or month. The striking characteristic of Mo-so writing is the naïve and refreshing realism manifested by the representations of animal pictures. We see many birds on the wing, well-outlined heads of mammals, and even complete beasts like a horse, a stag, and a tiger (Fig. 4). In de Lacouperie's manuscript (Pl. iii, Nos. 101 and 102) we note an elk and a yak of surprising naturalness; and M. Bacot (p. 79) gives two sketches of ravens, which breathe a truly artistic spirit. Of animal heads, the goat chewing herbage (*ibid.*, p. 77) and the mule (p. 96) are remarkable. Others are less good, and could hardly be guessed without commentary. The ethnologists interested in the decorative art and picture-writing of primitive man will find here ample and interesting material for study. In the human face we find the front as well as the profile represented in the Nichols manuscript (Fig. 3, line 4). As a rule, the human figure is strongly abridged, characterized only by a circle to which lines are attached, marking arms and feet. In the first line of Figure 3 we observe the outlines of a house, in the interior of which are standing two persons, the second being distinguished by a head-dress. This design is many times repeated in our text. M. Bonin had already drawn attention to it, interpreting it as the expression of the idea of the family, man and wife living in their house. M. Bacot (p. 91) adopts another explanation, which is, "host who receives, master of the house." This being the case, the person honored by the head-dress would be the guest. Headgear, presumably a helmet, is met also in connection with warriors brandishing a weapon (Fig. 3, line 2), a symbol which according to Bacot (p. 71) means "to fight." Accordingly, two stages are notable in Mo-so writing,—full pictures of natural objects and conventionalized shortenings.

But this is not all; we encounter even abstract symbols of geometric character, especially for conveying abstract and verbal notions, and sometimes even denoting living beings. Thus the horse is represented by a square #, very much like the Chinese character signifying a "well." A "road" is expressed by a multiplication sign plus a dot in the lower part (⊗) If a horizontal line is added above (⊗), the symbol signifies a "king." It is difficult to discuss the majority of these symbols without having reference to reproductions of them in the text.

In the writing of the Lo-lo the pictographic characteristics, if they ever existed, have disappeared; and the symbols are composed of decidedly geometric elements. They are pre-eminently ideographic, while Mo-so has a pictographic substratum with a tendency to strive for simplification. There is no similarity or coincidence between Lo-lo and Mo-so characters.[17]

[17] The best means for the study of Lo-lo writing are the books of Father P. Vial, "De la langue et de l'écriture indigènes au Yun-nan" (Paris, 1890), "Les Lolos" (Shanghai, 1898), and "Dictionnaire français-lolo" (Hongkong, 1909). A Lo-lo manuscript of twenty folios has been reproduced in facsimile by Professor F. Starr of Chicago (in fifty copies).

EUROPE AT TURKEY'S DOOR

By LEON DOMINIAN

[With separate map, Pl. I, facing p. 288]

The dismemberment of Turkey is the goal which Europe has steadily aimed at since the loss of the Holy Land to Christendom. It will also be the last chapter in the long history of Europe's commercial conquest of western Asia. Three causes operate in favor of this partition: the country is rich in natural resources; it is held by a people whose incompetence to convert nature's gifts into use or profit is historically patent; it occupies a commanding situation with reference to the trade of Europe with Asia or Africa. These three points are fundamental in the solution of the Turkish problem.

The European nations most vitally concerned in the dismemberment of the Sultan's dominions are four in number. Great Britain's interest is born of the Empire's relation to Egypt and India. The cause of Russian progress depends on the country's access to warm seaports. Germany, the newcomer on the scene and a land power, is engaged in extending her land area. To her sons Turkey offers an attractive colonization area and at the same time the land route which will render them independent of the sea way passing through Suez to the East. As a colonial power of the first magnitude no less than on account of her millions of Mohammedan subjects, France cannot be disinterested in the fate of the core-lands of Islam.

Turkey is the Asiatic pendant of the intercontinental highway represented in Europe by the Balkan Peninsula. Through Asia Minor it provides a convenient causeway between Asia and Europe. Through Arabia it connects Asia with Africa. Again, through the combined position of Asia Minor and Syria it makes possible continuous land travel from Europe to Africa. Turkey is thus the center of the eastern hemisphere. Mastery of its territory is bound to turn the flow of intercontinental trade into the lap of its holders. The entire history of European conflict over Turkish lands is wrapped around this geographical fact.

Italians were the pioneers of European trade with Turkey after the consolidation of Ottoman power. In this, Genoese and Venetian traders merely followed in the footsteps of their fathers, whose dealings with the Byzantines had been considerable. French merchants were not slow to compete with the Italians. In the fifteenth century English drapers and commissioners begin to appear on the Levantine scene. Germans show signs of activity a hundred years later but confine their operations mainly to the European dominions of the Sultans. From these beginnings to the twentieth-century territorial claims of each of the great powers over Turkey is but a natural economic unfolding.

Turkey's remarkably central position in the eastern hemisphere converts the country into the threshold of Great Britain's Asiatic dominions as well as into the natural land connection between British Africa and British Asia. From India and the British zone in southern Persia as defined by the Anglo-Russian convention of 1907 westward to the sultanate of Egypt, southern Turkey, represented by Lower Mesopotamia and Arabia, is the only stretch of territory in which the British government does not exercise direct control. Even so, the task of consolidating British influence in these two regions of the Turkish Empire is well advanced.

In the economic life of modern Mesopotamia British influence is paramount. About 90 per cent of the trade of Basra and Bagdad is in British hands. Steam navigation on the Euphrates and Tigris, with its attendant privileges of transportation, is a monopoly exercised by Englishmen. This means that all Persian trade which enters or leaves the country through its southern Turkish border must pay toll to British capital. Most important of all, the stupendous task of reclaiming the great twin river valley has fallen to the share of English enterprise.

The area of agricultural lands in Lower Mesopotamia is generally calculated at ten times the total surface of farming land in Egypt. The territory suited for cultivation extends northward from the Persian Gulf roughly to a line drawn from the bend of the Euphrates at Anah to Tekrit on the Tigris. Its eastern boundary is defined by the Zagros and Pusht-i-Koh Mountains. On the west it is limited by the Great Syrian Desert. Thus delimited the region is the great alluvial plain of Mesopotamia. A stretch of land remarkably rich in humus, it only needs to be administered justly and developed properly in order to become highly productive.

In olden days the entire district was one vast field. Its fertility had earned for it the name of granary of the world. Herodotus extols its productivity: "... In grain it is so fruitful as to yield commonly two-hundred fold and, when the production is the greatest, even three-hundred fold. The blade of the wheat plant and barley plant is often four fingers in breadth"[1]. In their present state the once productive lands present the appearance of a desert. The old irrigation ditches are in ruins. Mile upon mile of bare clayey soil or dreary marsh occupies the site formerly given up to grain growing.

The reclamation of this parched country was undertaken in 1908 by British engineers headed by Sir William Willcocks. In the delta region of Mesopotamia, comprising the entire drainage valley extending south of Hit on the Euphrates and of Samara on the Tigris, between twelve and thirteen million acres of first-class irrigation land were to be converted into productive areas. In spite of Turkish opposition the work advanced with sufficient rapidity for the Hindiyeh Barrage to be inaugurated in 1913. After the

[1] Bk. I, Chap. 193. Babylonia's fertility is also noticed by other ancient writers. Cf. footnote in Rawlinson's Herodotus, Vol. I, p. 258, Appleton, New York, 1859.

lapse of twenty centuries a handful of plucky northerners had, notwithstanding well-nigh insurmountable obstacles, put the last touches to the project of drainage regulation begun on the same spot by Alexander the Great, the construction of a new head for the Hindiyeh branch, or Pallocopas, having been that monarch's first public work in Babylonia[2].

In the Persian Gulf British influence advanced in great strides during the present century. Within the last ten years the policing of the gulf waters and harbors has been undertaken by English men-of-war. An appreciable curtailment of the trade in fire-arms followed the tracking of gun-runners by British captains. The important towns of the Persian or Arabian coast are virtually British possessions. Bushire[3] on the eastern shore, Koweit on the west are protectorates. The trend of it all is to advance India's western frontier to the line of the Euphrates.

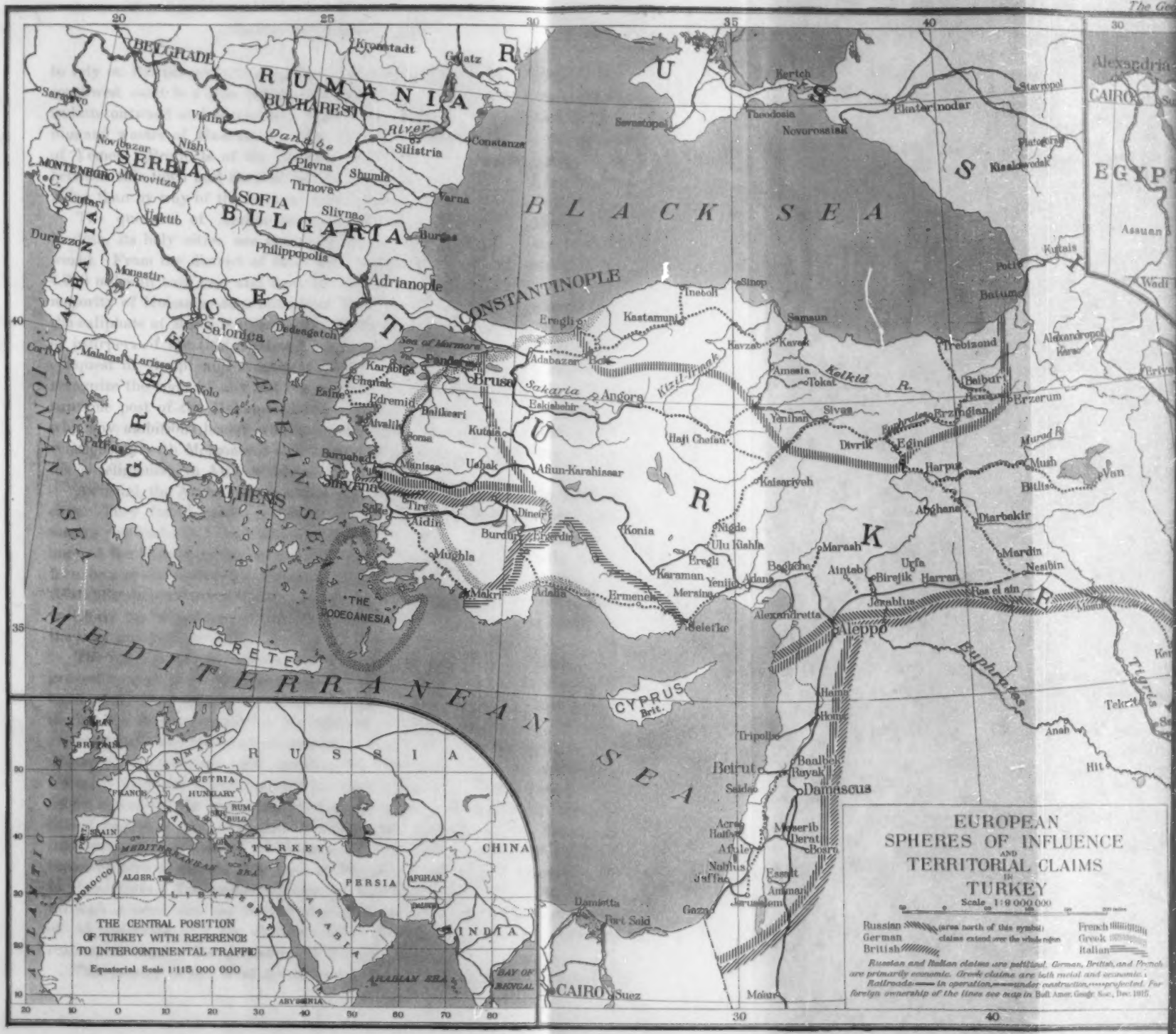
For Great Britain's attitude toward Turkish politics is determined at Delhi rather than London. As ruler of the most numerous political group of Mohammedans in the world, the King of England's residence in his European capital cannot affect India's geographical exigencies, among which the maintenance of a clear road from its shores to the mother island is of prime import. Thus the establishment of a British zone in southern Persia and the attempt to substitute British law in Mesopotamia, where, after all, the Sultan's authority is most precarious in character, merely reveal England's necessity for consolidating her power over the approaches to her great Asiatic colony.

In dealing with Indian geography and the vast body of Mohammedan Hindus attention is necessarily riveted by the question of Arabia. England's stewardship of the peninsular tableland seems inevitable. Not that the huge wastes of burning sand contain resources convertible into profit. But Arabia today, in virtue of its position, represents a wedge of barbarism driven against the civilizing influence exerted by England in Egypt and India. The danger of its proving to be the generating center of revolutionary currents which will involve British colonial policies in destruction is not mythical. Millions of Indian Moslems turn daily in prayer toward the direction of the Kaba'a. A glance at India's history suffices to reveal the extent to which the Gulf of Oman has linked the two peninsulas.

To detach Arabia from a shadowy allegiance to the Sultan of Turkey and bring it within the uplifting sphere of British activity was part of the political program elaborated at Downing Street after the bombardment of Alexandria in 1882. In pursuance of this policy British influence is now markedly felt along Arabia's three coasts. It is firmly planted on the southeast, where Arabia is nearest to India. From Koweit to Mascat every petty potentate exercising an antiquated patriarchal authority has learned

[2] William Willcocks: The Irrigation of Mesopotamia. Spon & Chamberlain, New York, 1911, pp. 13-14.

[3] Bushire, with a population of about 20,000 inhabitants, owes its importance to its being the southern sea terminus of the caravan route which starts at Teheran and passes through Isfahan and Shiraz.


BELGRADE
RUMANIA
BUCHAREST
Danube River
SERBIA
MONTENEGRO
SOFIA
BULGARIA
ALBANIA
GREECE
ATHENS
IONIAN SEA
AEGEAN SEA
MEDITERRANEAN SEA
THE DODECANESIA
CRETE
BLACK SEA
CONSTANTINOPLE
Sea of Marmora
Adrianople
Philippopolis
Salonica
Brusa
Angora
Sakaria R.
Kizil Irmak
Kelkid R.
Afiun-Karahissar
Konia
Smyrna
Aidin
Mughla
Makri
Adalia
Scleucia
Aleppo
Euphrates
Tigris
CYPRUS
Brit.
Beirut
Damascus
Tripolis
Hama
Homs
Baalbek
Ruyak
Saidon
Acre
Haifa
Nablus
Jaffa
Jerusalem
Gaza
Port Said
Damietta
CAIRO
Suez
Maiur
Alexandria
EGYPT
Assuan
Wadi
Kutais
Batum
Trebizond
Erzerum
Erzingian
Sivas
Kaisariyeh
Harput
Mush
Bitlis
Van
Diarbekir
Mardin
Nesibin
Urfa
Birejik
Harran
Aintab
Marash
Ulu Kishla
Nigde
Kaisariyeh
Haji Chefan
Divrik
Egin
Murad R.
Yenihan
Kastamuni
Ineboli
Sinop
Samsun
Kavak
Amasia
Tokat
Erekli
Eskishehr
Kutaia
Ushak
Burdur
Mersina
Karaman
Yenije
Adana
Bagtche
Ermenek
Alexandretta
Selefke
Dineir
Tire
Sorna
Balikesri
Edremid
Ayvalik
Karabiga
Chanak
Eskia
Panderma
Adabazar
Bolu
Kavzan
Ineboli
Sinop
Samsun
Trebizond
Batum
Kutais
Poti
Kertch
Theodosia
Sevastopol
Novorossisk
Ekaterinodar
Stavropol
Kisalovodsk
Petrograd
Kiev
Odessa
Galatz
Kronstadt
Varna
Burgas
Slivno
Shumla
Tirnova
Plevna
Silistria
Constanza
Nish
Novibazar
Vidin
Sarajevo
Mitrovitza
Scutari
Ipkub
Durazzo
Monastir
Prevesa
Corfu
Patras
Malakasi
Larissa
Volo
Dedeagatch
Eafina
Chanak
Karabiga
Edremid
Ayvalik
Burnabed
Manissa
Smyrna
Aidin
Mughla
Makri
Adalia
Konia
Afiun-Karahissar
Kutaia
Ushak
Burdur
Eregli
Karaman
Yenije
Adana
Mersina
Ermenek
Alexandretta
Selefke
Aleppo
Hama
Homs
Tripolis
Beirut
Baalbek
Ruyak
Damascus
Saidon
Acre
Haifa
Nablus
Jaffa
Jerusalem
Gaza
Port Said
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Suez
Maiur
Esdud
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Derat
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Aquile
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Hit
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Tekrit
Kerkuk
Mosul
Nesibin
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Harput
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Murad R.
Egin
Divrik
Haji Chefan
Kaisariyeh
Nigde
Ulu Kishla
Marash
Aintab
Birejik
Harran
Urfa
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Ras el ain
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Urfa
Birejik
Harran
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Ulu Kishla
Nigde
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Haji Chefan
Divrik
Egin
Murad R.
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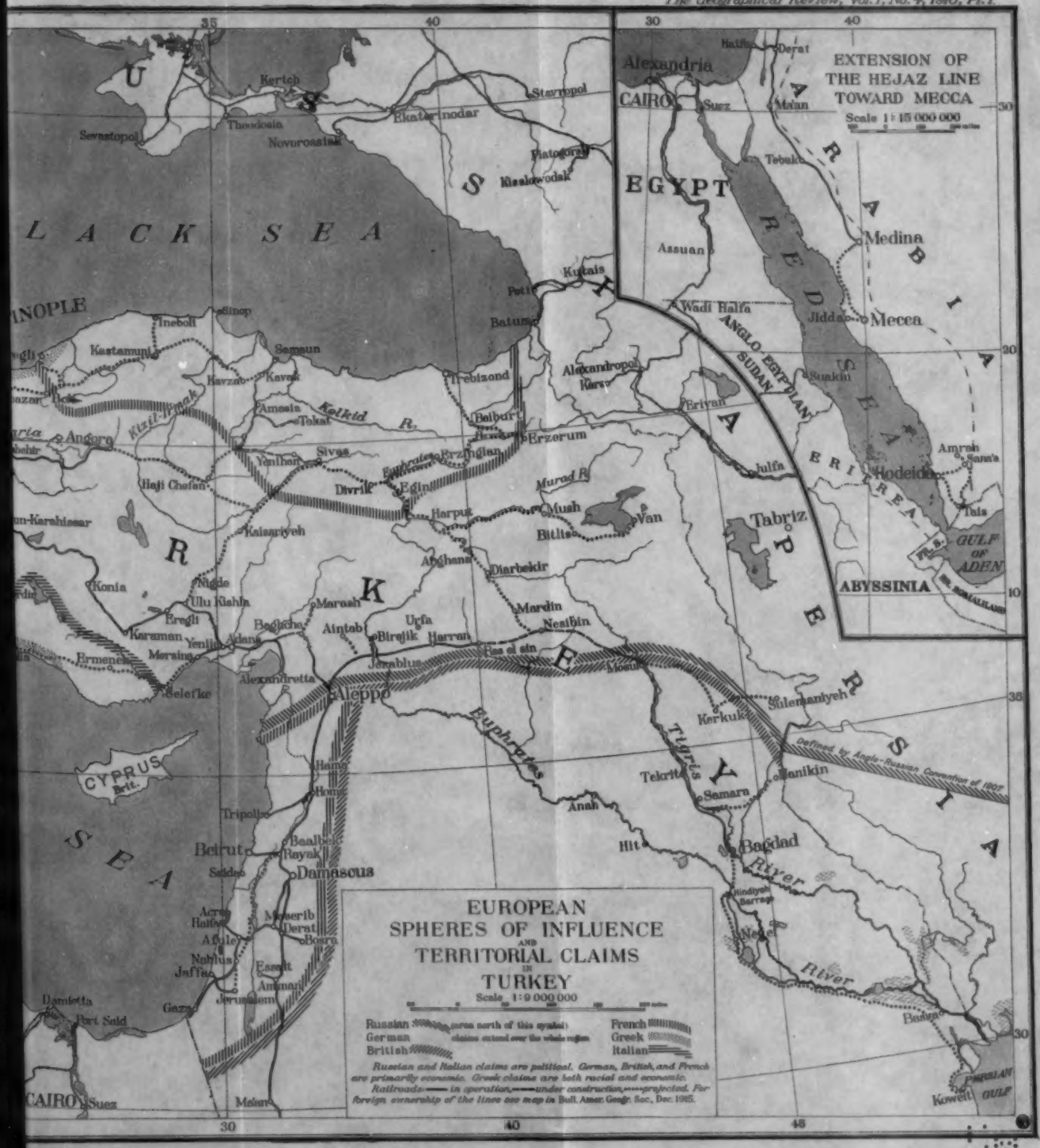
EXTENSION OF THE HEJAZ LINE TOWARD MECCA
Scale 1 : 15 000 000
EGYPT
ARABIA
RED SEA
Alexandria
CAIRO
Suez
Haifa
Derat
Ma'an
Tebuk
Medina
Assuan
Wadi Halfa
Jidda
Mecca
ANGLO-EGYPTIAN SUDAN
Suakin
Eritrea
Amran
Sana'a
Hodeida
Taiz
Tabriz
PERSIA
Julfa
Urmia
Mush
Van
Bitlis
Harput
Erzerum
Erzingian
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Sinop
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Semsun
Kavza
Kavak
Amasia
Tokat
Kelkid R.
Balbur
Alexandropol
Kars
Eriwan
Angora
Kizil-Irmak
Yenihan
Sivas
Euphrates
Divrik
Egin
Murad R.
Haji Chefen
Kaisariyeh
Afghan
Diarbekir
Mardin
Nesibin
Konia
Nigde
Ulu Kishla
Eregli
Karaman
Yenije
Adana
Marash
Aintab
Urfa
Birejik
Harran
Jerablus
Ras el ain
Mosul
Aleppo
Alexandretta
Seleflke
Ermenek
Mersina
Euphrates
Tigris
Kerkuk
Suleimanyeh
Defined by Anglo-Russian Convention of 1907
Tekrit
Samara
Anah
Hit
Baghdad
Tripoli
Homs
Hama
Baalbek
Rayak
Beirut
Saida
Damascus
Tiberias
Acre
Haifa
Afule
Nablus
Jaffa
Jerusalem
Ammam
Mesherib
Derat
Bosra
Gaza
Damietta
Port Said
CYPRUS
Brit.
Kindyah Barrage
Nejef
Basra
Kuweit
PERSIAN GULF
RED SEA
GULF OF ADEN
ABYSSINIA
EUROPEAN SPHERES OF INFLUENCE AND TERRITORIAL CLAIMS IN TURKEY
Scale 1:9 000 000
Russian (area north of this symbol)
German (claims extend over the whole region)
British
French
Greek
Italian
Russian and Italian claims are political. German, British, and French are primarily economic. Greek claims are both racial and economic.
Railroads: —— in operation, —— under construction, ····· projected. For foreign ownership of the lines see map in Bull. Amer. Geogr. Soc., Dec. 1915.
35
40
30
40
30
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45

to rely on British protection against Turkish encroachments. Aden on the southwest coast is a lone outpost of civilization from which Western ideas radiate outward and occasionally attain the plateau land of Yemen or the niggard wastes of Hadramut. This British seaport is the natural outlet of Yemen. Products of the favored districts around Kataba, as well as between this town and Sana'a, can be transported with greater facility to Aden than by way of the arduous routes which lead to Red Sea harbors.

The question of Arabia involves other considerations. Mecca and Medina, its holy cities, are essentially the religious center of the Islamic world. From the district of their sites Mohammedanism has spread about 4,000 miles in both east and west directions. Among Arabs as well as the majority of Mohammedans outside of Turkey, desire for the restoration of the caliphate at Mecca is strong. The Arabs, especially, consider the sultans as usurpers of the title. Selim I had been the first to adopt it after the conquest of Egypt and Arabia in 1517. The Arabs, however, refuse to recognize the right of any but descendants of the Prophet's family to this supreme post of the Mohammedan ecclesiastical hierarchy. This explains why any ambitious leader who succeeded in circulating the report of his relationship with Mohammed's progeny always secured a following among his co-religionists in Asia or Africa.

As usual, the Arabs have vented this chief grievance of theirs in English ears. They found ready sympathy among British officials no less than among the leaders of their faith in Egypt or India. The complete severance of the Mohammedan caliphate from the Turkish sultanate will, therefore, be a probable result of Franco-British success in the present war. The reëstablishment of the Prophet's family in its hereditary right and capital will have the advantage of providing Islam with a geographical center at the very point of its birth.

The rise of modern German ascendancy in Turkey has constituted the gravest menace to the British project of uniting Egypt to India by a broad band of British territory. German diplomacy has exerted its best efforts during the past generation in the attempt to defeat this design. In overcrowded Germany the need of land for colonization is felt as keenly as the necessity of providing new markets for the country's busy industries. Germany does not contain within its frontier an agricultural area of sufficient extent for the requirements of its fast-growing populations. Against this it has been estimated that with adequate irrigation Asia Minor can turn out a million tons of wheat annually as well as at least two hundred thousand tons of cotton. The basis of Teutonic southeasterly expansion lies in these facts. The immediate aim of German imperialism is to spread through Austria and the Balkan Peninsula into Turkey down to the Gulf of Alexandretta and the shallow waters of the Persian Gulf. But its realization implies the shattering of British projects.

This rivalry in the West Asian field became inevitable from the moment

that men of German speech became conscious of the power they had acquired in 1870 by banding together in a single state. The task of national consolidation once accomplished, the thought of German leaders naturally turned eastwards in the direction in which land extended. Eight years later the prestige acquired by the newborn empire gave it a decisive voice in the Treaty of Berlin. The first peg in the line of the Teutons' southeasterly march was driven then by the revision of Bulgarian frontiers delimited by the Treaty of San Stefano. The Slavic obstacle seemed removed from the Teutons' path and its place filled by the more easily negotiable Turkish obstruction.

From the date of that treaty to the events of the past year, Germany's conduct in Turkey has been determined entirely by the call of the land. In 1882 a German military commission undertakes to reorganize the Turkish army. In 1889 the Deutsche Bank—whose directors are the real leaders of Germany's oversea affairs—is granted a concession for a through line from Constantinople to Konia. This concession has since been modified so as to comprise the trans-Anatolian trunk railway which connects the capital with Bagdad. In 1898 the Kaiser visits Damascus in person, there solemnly to proclaim assurances of his unalterable good-will to the millions of Mohammedans scattered over the surface of the earth. In 1902 the Bagdad line is definitely awarded to a group of capitalists, among whom Germans represent the majority of investors. Henceforth, railroad, mining, and irrigation concessions in Turkey seemed to have been reserved exclusively for Germans. The transfer of Turkey's unexploited riches to German ownership became almost an accomplished fact.

It was the "Drang nach Osten," a movement directed primarily by the valleys of the Danube and the Morava, and forking out subsequently along the Vardar and Maritza gaps. To clear this road to Turkey Serbia was wiped off the map of Europe in the fall of 1915 by Teutonic armies. For this, too, had Serbian nationality been split into three separate bodies at the behest of Teutonic diplomatists. Bosnia and Herzegovina, lands Serbian in heart and logic, were administered by Austria, an empire in name, like Turkey, but virtually ruled by Prussia since the day of Sadowa. Montenegro, of old the refuge of martyred Serbia, had always been prevented by Austria from uniting with its sister state. In truth Serbia lay under the bane of a geographical curse. It was always in the way.

This misfortune of position is shared fully by Turkey. Coming at right angles to Germany's southeasterly drive, Russia's steady southwesterly advances in the nineteenth century foreshadowed the conversion of the whole Black Sea and its Bosporus entrance into Russian waters. With the most rugged parts of the Armenian massif in Russian hands since 1878, farther expansion through western Armenia into Anatolia cannot be delayed much longer.

The Russian viewpoint deserves every consideration. Russia lies be-

numbed by the cold of her frozen land. She has had one long winter since the dawn of her nationality. The chief reason why her sons have been laggards in the liberal progress of the past hundred years must be sought in this simple fact of geography. Russia does not need more land or fresh resources. She only seeks the warmth of the sun's rays. Extension of her southern frontiers is forced upon the country, owing to the severity of its climate. Geographically it is Russia rather than Germany who is entitled to "her place under the sun." Individual liberty and democratic institutions will penetrate the country through the portals which genial climate will allow to be maintained wide open.

Russian access to the open sea in the southwest can be secured either by Constantinople or Alexandretta. The Bosporus route is the most advantageous, as the markets for products of the plains of southern Russia are strewn along the coasts of the Mediterranean. But mastery of the Bosporus is of little value to Russia without possession of the Dardanelles strait. The Marmora is but the lobby of the Black Sea. The entire Bosporus-Dardanelles waterway must, therefore, be Russian in order to allow the country to reap the full advantages of attaining ice-free seas. If fifty years ago the question was merely one of political foresight, today it has assumed vital importance, for southwestern Russia's economic development in the present century has made the country absolutely dependent on Balkan and Mediterranean markets.

As an alternative, the harbor of Alexandretta finds favor among Russians. It lies at a distance of only 450 miles from the southern Caucasus frontiers. Moreover, it is part of the ancient land of Armenia, which, sooner or later, is destined to become a Russian province in its entirety. Such an extension of Russian territory to blue water on the Mediterranean has significance in two ways. It would redeem a land that has remained Christian in spite of centuries of Mohammedan yoke, and it might effectively bar German access to the Persian Gulf.

Russian influence in Turkey differs signally from the control exerted by its three western competitors. British, German, or French encroachments on Turkish sovereignty have increased in proportion to the amount of capital expended by each of these countries for the development of Turkish resources. In this respect Russia, which is not a financier's country, stood at a disadvantage. To overcome this condition of inferiority Russians resorted to borrowing from France or England, mainly the former, and invested the funds thus obtained in Turkey. Such transactions have in reality been the means of widening French or British influence in Ottoman lands. The northeastern region of Anatolia, which, owing to its contiguity to Russia, was regarded as a sphere of Russian influence, has lately been looked upon often as a zone of French interests, owing to the participation of French capital in its development. But from a geographical standpoint this alleged French zone is artificial. Its dependence on

Russia cannot be altered as long as its position on the map remains unchanged.

France's natural sphere of interest in Turkey will be found in the Syrian vilayets. Neither is this due to the financing of Syrian public utilities and industries by French capitalists, as is often stated. The relation is the offspring of the Mediterranean, which since the dawn of history has linked the southern French coast to Syrian harbors. Phoenician oversea trade in the first millenium before the Christian era had attained the coasts of Provence and Languedoc. Marseilles, a city born of this intercourse, has maintained commercial relations with Syria uninterruptedly down to the present time.

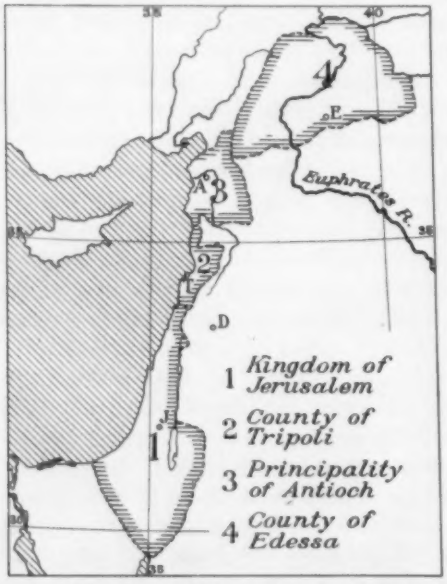

FIG. 1—French states in Syria at the time of the Crusades. Scale, 1:11,500,000. Based on Pl. 68, Historical Atlas, by W. R. Shepherd, Holt, New York, 1911.

Franco-Syrian ties were strengthened considerably during the Crusades. The conquest of Syria and Palestine by the Arabs diverted the thoughts of Christendom from the economic importance of these lands to their religious appeal. France, "the eldest daughter of the Church," took the lead in the attempt to wrest the Holy Land from its Mohammedan conquerors,—"*gesta Dei per Francos.*" Many of the petty states founded by noblemen who took part in the Crusades were ruled by Frenchmen. Antioch and Tripoli had French princes, Jerusalem a French king. The title of "Protector of Oriental Christians" conferred by the Papacy on French kings had its origin in the active part played by France in the Crusades.

France has exercised a dominant intellectual influence in the Levant for at least seven centuries. Turks bestow the appellation of "Frank" on Europeans without discrimination of nationality. Western ideas which have trickled down to Turkish soil are French in character. French schools in Turkey are more numerous than the educational institutions maintained by any other foreign country. The civilizing power of French culture showed its strength by the readiness with which it asserted itself in the midst of uncongenial Turkish thought. France's hold on Turkey thus is of a high moral order. It differs in this respect from the material claims brought forward by the other European powers.

At the same time through the investments of French capitalists a well-defined zone of French interests has been created in Syria. Excepting the Hejaz line, every railroad in the province has been financed in France. The silk factories of the Lebanon, around which the whole industrial life of Syria clusters, have been started by French citizens. Their annual product, usually estimated at half a million kilograms of silk, is exported to France. Syrian silk farmers in need of funds for the annual purchase of cocoons raise their loans exclusively among the banking houses of Lyons. Without, however, confining French interests to Syria alone, it is enough to state that fully one-half of the amount of one billion dollars representing Turkey's official debt to Europe has been advanced by French financial institutions.

It is difficult to assign a place to Italy in the array of European claimants to Turkish territory. The trade between Italian and Turkish seaports has lost the relative importance it had acquired in medieval times. Italian pretensions to Adalia Bay and its rearland are of quite recent date and the result of conquests in Libya. But beyond vaguely formulated promises for railway concessions from the Turkish government no ties bind the region to Italy. The country, however, created its own sphere of interest somewhat unintentionally by the occupation of the islands of the Dodecanesia. It outpaced by this act every other European country taking part in the race for a share of Turkey.

The group of islands lying off the southwestern coast of Anatolia is now held by Italy in virtue of stipulations covenanted with Turkey at the Treaty of Lausanne in 1912. According to the terms agreed upon, Italy was to occupy the islands in guarantee of Turkish good faith pledged to prevent anti-Italian agitation in Libya. Upon complete pacification of the latest territorial addition to Italy's African domain, the political fate of the islands was to be determined jointly by the six Great European Powers.

The islands, between twelve and fifteen in number, are peopled exclusively by Greeks. Hellenic customs, language, and religion have survived upon each in spite of centuries of Turkish rule. Italian sovereignty, however benevolent or tending to promote the welfare of the islanders, is disliked equally at Patmos, Leros, Cos, or Rhodes. The remaining islands are relatively unimportant, sometimes consisting of mere uninhabited rocks emerging to a height of two or three hundred feet above the Aegean. But, to the smallest inhabited islet, annexation to Greece is keenly desired. The Italians were hailed as liberators from the Turkish oppression by the hardy fishermen, who labored under the impression that their island homes had been rescued in order to be annexed to Greece. Their disappointment was expressed in mass meetings at Patmos and Cos in 1913.

Racial and historical considerations add their burden of proof to the linguistic claims advanced by the Greeks in Greece and the Dodecanesia. As sailors the islanders have maintained to this day classical traditions of

Hellenic maritime activity in the region. The islands in fact constitute lands of unredeemed nationality whose natives are without a single exception of the same race as their kinsmen on the mainland.

This fact, combined with the distribution of a numerically preponderant Greek element along the western coast of Anatolia, converts the Aegean into a truly Greek sea. Structurally the coastlands encircling this body of water are identical. In the east as in the west they constitute the upwarped margin of a subsided area. Identity of land and peoples has given rise to the Greek claims on western Turkey. Greece, therefore, stands in line with the other European nations expecting to share in the inheritance of the moribund Turkish state.

The claim is historical no less than economic. The association of the Aegean region with centuries of Hellenism and fully one millenium of Byzantinism is by no means severed in modern days. For the second time in its glorious history, the ancient city of Athens has become the social, political, and intellectual center of the Greek world. In one and the same prospect the Greek capital can point with pride to the Hellenic splendor emanating from Anatolian ruins and to her modern sons achieving daily economic victories over the Turk in his own land.

In this spectacle of nations lying athwart each other's path the clue to the adequate settlement of the Turkish problem may be found. Turkey is above all else a roadway—a bridgeland. The fate of the country is bound to this fact. It cannot avoid it. As soon as this point of practical geography is recognized it will be easy to provide international legislation in which the claims of interested powers will be harmonized. But no solution of the political problem involved can ever be attained without full consideration of its geographical aspects. Omission of the available data of science implies neglect of the realities of the case. It will leave the Eastern question in the hopeless tangle in which it has labored for the past hundred years.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

New Fellows of the Society; Monthly Meeting of February. A regular monthly meeting of the Society was held at the Engineering Societies' Building, No. 29 West Thirty-ninth Street, on Tuesday evening, February 29, 1916. President Greenough presented by name the following fifteen persons, recommended by the Council for election as Fellows, and after a vote they were declared elected:

E. C. Andrews
J. P. Ault
Henry A. Christian
William W. Clendenin
Countess Eila Festetics
William M. Gregory
John W. Harshberger
George A. Mulloy
Howard Notman
Charles W. Obermaier
John M. Phillips
George Shiras, 3rd
Howard E. Simpson
J. W. Stromberg
Thomas M. Weed

Dr. Frederic Poole then addressed the Society on "China, Ancient and Modern."

At an extra inter-monthly meeting on January 11 Mr. Frederick I. Monsen, F.R.G.S., spoke on "Turbulent Mexico."

NORTH AMERICA

The Growth of Connecticut as a Manufacturing State. The industrial character of Connecticut appears from the figures in the U. S. Census Report on Manufactures for 1900-1905. The state accounted for 80.7 per cent of the rolled brass and copper, 72.2 per cent of the ammunition, 69.4 per cent of the clocks, 66.9 per cent of the plated ware, 51.6 per cent of the brass ware, and 46.9 per cent of the hardware produced in the entire country. Germs of this development existed in 1818—a date for which reliable information is attainable—and indeed earlier, for industrial change was gradual. The Revolution had wrought no startling metamorphosis ("An Introduction to the History of Connecticut as a Manufacturing State," by Grace P. Fuller, *Smith College Studies in History*, Vol. I, No. 1, 1915). The state still imported little raw material, and its exports were still confined to extractive products from the limits of the tidewater area. The five incorporated towns owed a large share of their prominence to commerce, a fact particularly true of New Haven, with its considerable foreign commerce, and New Bedford in the heyday of its whaling industry. This period of the early nineteenth century marked the first stage of emergence from the old-time handicraft manufacturing. The back-country towns indeed continued dependent on their own industry for all kinds of manufactured goods. Contemporary records list 38 such rural towns—about half the actual number—as having only the slightest contact with the outside world. Towns with a genuine outside market numbered 45. In these, business was for the most part conducted on the social-order method excepting only in the two capitalized industries of straw-braiding and shoe-making, where domestic work predominated. At this epoch the state was supporting a maximum population for its agricultural resources, and the major part of its increase emigrated westwards.

In 1845—another date for which satisfactory evidence is forthcoming—the state was still primarily agricultural. Sixty per cent of the population lived in distinctly agricultural towns (i. e. townships) of under 3,000, and many of the dwellers in the manufacturing towns were dependent on agriculture for a livelihood. But the manufacturing possibilities of the state were now more apparent. Although the supply of raw material was poor, means of communication were good for the time. Already by 1845 the east-to-west waterway of Long Island Sound was connected with the Western (Boston and Albany) Railroad by three cross-country lines. Water-power resources were exceptional, and labor, though limited in quantity, was of superior quality. Scarcity of the latter played a significant part in deciding the particular form of manufacturing evolution. Unlike the English development, manufacturing in New England passed directly from the handicraft stage to the factory without the intermediate domestic system. The agricultural expansion of the West created a new attitude towards labor in the East, bestowing on it value and dignity. The mid-century period also pointed out the destined specialization of Connecticut manufacturing. Notable early industries disappeared—the iron manufacture of Litchfield, the flour-milling of the southwest shore,

the distilling of the agricultural section above Hartford. Textiles made little progress, but light metal wares increased. The manufacture exemplified by "Yankee" notions, clocks, and tinware, formerly peddled industriously—almost notoriously—by Connecticut sons in the South, was soon to enter on the grand stage of production and to make the state primarily manufacturing. The change may be said to have been reached between 1870 and 1880. In 1870 the population was almost twice that of 1820, when agriculture was supporting the maximum density for the time, and in 1880 more than half the people had come to live under urban conditions.

Lundbreck, Alberta: A Mining Venture. Lundbreck is a foothills village west of Lethbridge, Alberta. Much of the originally forested Crows Nest Valley, in which the village is located, has been repeatedly burnt over and the forest replaced by prairie,—excellent grazing land and favored moreover by the climatic advantage of well-developed chinook winds in winter. The withdrawal of the native Indians to reservations in the early eighties cleared the way for a large-scale grazing industry. Great ranges existed until the appearance of the railroad and the homesteader in 1897. Six years later a station was established on the site of Lundbreck. Thus was afforded facility for shipping the coal known to occur at that point. Two mining companies commenced operations; a

FIG. 1—The coal-mining "boom" town of Lundbreck, Alberta, in its present decline. (Photo from Canadian Geological Survey.)

combination of their names furnished the designation for the town that rapidly sprang into existence. Steady progress was made until 1907, when work at the mines became spasmodic. During the summer the place was practically deserted: in the fall of 1908 one company, employing some fifty men, was shipping its coal to Spokane, the other remained closed for the greater part of the year. The decline continued until 1911, when there was a revival of business—the daily output increased from 30 to 450 tons, 150 men were employed, and the town population rose to 300. These non-union mines had been able to profit by a general strike of the West Canadian coal fields; but the boom was necessarily short-lived, and a decline set in once more. In 1914 coal was extracted for local consumption only. The miners—chiefly English, Scotch, Welsh, and Nova Scotians—nomadic like all their kin in the regions of the prospector, dispersed to other fields, except a few who took up homesteads in the vicinity. These with the earlier settlers constitute the support of the present village of some fifty souls. Causes of the decline are to be found in difficulties inherent in the resource itself, in the lack of a home market and competition with more favored areas, and in correlated mismanagement of the mining operations. The seams are intensely folded, broken by small faults and inclined to "pinch out." The mines need careful timbering, and timber is only to be procured at a distance. West of the Lundbreck area are the highly bituminous or anthracitic Kootenay coals: east is the great field of the Belly River formation.

Under such conditions it is not surprising that Lundbreck showed the evanescent features more characteristic of the mining of the precious metals. (Compare with the item below on "The Rise and Fall of the City of Gladstone.") JAMES S. STEWART.

The Rise and Fall of the City of Gladstone. Under this title the ephemeral life of a type of western city is described by C. C. Baker in the 1914 issue of the *Annual Publications of the Historical Society of Southern California* (Vol. 9, Part 3, pp. 188-194). The adventurous spirit which leads settlers into sparsely populated districts between the Rockies and the Pacific does not stop at creating cities whenever there appears to be opportunity for making boom sales of house lots. Gladstone owes its spectacular career to the great boom which swept over California in 1887. Its promoters saw in the town a future rival to Los Angeles.

But a city is a natural product. The causes of its existence are generally economic. As a rule it is a station on an avenue of trade. Its prosperity also depends on the natural resources of the environing country. Gladstone could not boast of special advantages in this respect. It was an unnecessary artificial creation—a venture launched, it may be suspected, for purposes of speculation rather than with other aims. Many mining settlements of the Gladstone type had a similar fate. Abandoned shanties mark their site in the deserts of California and Nevada, in the mountains of northern Idaho, and along the deep valleys of the Interior Plateau of British Columbia. (See also the preceding item on Lundbreck, Alberta.)

Another excellent example of the "ghost" cities of the West is described in an article that appeared under this title in the *Saturday Evening Post* (Philadelphia, Sept. 4, 1915). Before the great slump in the price of silver following demonetization, Eureka, Nevada, boasted a population little short—it is said—of five figures. According to the last Federal census the population of the precinct was only 661.

Winter Steamship Connection between Prince Edward Island and the Mainland. The old limits to the navigation of shores ice-bound in winter are being slowly pushed back. The success of the large British ice-breakers in extending the Archangel shipping season has attracted much attention. Now from Prince Edward Island comes the report that for the first time in the history of the island communication with the mainland has continued daily without interruption throughout the winter (*Commerce Reports*, March 13, 1916). This success has been achieved by the new car-ferry steamer acquired for the Charlottetown-Pictou (N. S.) service. Heretofore the heavy ice of Northumberland Strait has always constituted an impediment, whose effect showed itself in the diminished returns for freight and passenger traffic during the winter. During the months of January and February of the current year shipments to the United States were valued at $47,640, whereas for the corresponding period of the preceding year, with broken communications, they were only $16,329.

Distribution of Thunderstorms in the United States. The geographic distribution of thunderstorms is a matter of great meteorological and climatological interest—meteorological, because of the need of this information in our study of the origin and mechanics of these phenomena; climatological, because of the many relations which exist between thunderstorms and the life of man. Our crops, our safety, our water supply, our outdoor activities, are all measurably affected by thunderstorms and by their accompanying lightning and hail. Charts of thunderstorm distribution have been published in Professor Alfred J. Henry's "Loss of Life in the United States by Lightning" (*U. S. Weather Bur. Bull. No. 30*, 1901) and in the same writer's "Climatology of the United States" (*Bull. Q*, 1906). There has always, and naturally, been some difficulty in defining "a thunderstorm" for purposes of record and of charting. Thunderstorms vary in intensity from those of great violence, with well-defined characteristics, to those which amount to no more than a peal or two of thunder, perhaps without any precipitation. The official instructions for the observation of thunderstorms have varied from time to time during the period of our Government meteorological service, and this fact, together with the inevitable difficulty of accurate and specific observation, have made our records rather unsatisfactory.

What are likely, for some time to come, to be the standard charts of thunderstorm distribution for the United States have been prepared by Mr. W. H. Alexander and published in a recent number of the *Monthly Weather Review* (Vol. 43, 1915, No. 7). The period covered is 1904 to 1913, inclusive, during which time the systematic observation of thunderstorms, according to a uniform scheme, has been on a more satisfactory basis than in earlier years. Mr. Alexander has charted the total numbers of thunderstorms for each month and for the year during the ten-year period above noted. By dividing the numbers shown on the charts by 10 the average annual number is easily determined.

The chart of most general interest is that of the annual frequency. No part of the United States is entirely free of thunderstorms. There are two centers of greatest activity, one in Florida and the other in northern New Mexico. Around Tampa, Fla., 944 thunderstorms have been recorded in the ten years, and in the vicinity of Santa Fé, N. Mex., the number is 710. Our previous charts showed the center of maximum frequency over Florida, but did not indicate any marked second center over New Mexico. The new chart, further, does not bring out a center of considerable thunderstorm frequency over the lower Missouri valley, as did the earlier charts, although the general bending of the lines of equal annual 10-year numbers on Mr. Alexander's chart, northward and northwestward up the Mississippi and Missouri valleys, emphasizes the favorable conditions of thunderstorm occurrence over that region. R. DEC. WARD.

A New Isogonic Chart of the United States. *Special Publication No. 33* of the U. S. Coast and Geodetic Survey contains a map showing lines of equal magnetic declination and of equal annual change in the United States for 1915. This map is a revised edition of the isogonic chart published in 1910 in *Special Publication No. 9*. Since that time the results of observations at more than one thousand new stations and two hundred repeat stations in the United States and adjacent parts of Canada have become available. These data are being collected in the course of operations undertaken since 1899 with the object of making a magnetic survey of the United States.

The map shows that the line of no change of declination runs from the Lake of the Woods through St. Paul, Minn., Springfield, Ill., to Key West, Fla. For places east of this line the north end of the compass needle is moving to the westward, and to the eastward for places west of that line, at annual rates indicated on the map. The agonic line, or line of no declination, for 1915 lies somewhat to the east and passes through the lower end of Lake Michigan, western Ohio, and southwestern South Carolina, leaving the land at Beaufort and continuing through Nassau in the Bahamas and the eastern tip of Cuba. The disturbing influence of the Appalachians is evident from the irregularity of the line in that region.

The Northern Hardwood Forest of Eastern North America. The northern hardwood forest, occupying approximately 50,000,000 acres mainly in the basin of the Great Lakes and the St. Lawrence, with a southern offshoot on the Appalachians, centers around the area of maximum exploitation of the white pine. Its limits are almost exactly defined by the range of the yellow birch, with the sugar maple the most characteristic hardwood tree. The northern is further distinguished from the southern hardwood forest by the presence of spruce and hemlock, the absence of yellow poplar, red gum, and sycamore, and also by relative simplicity of composition. It has only 21 hardwood species against the 95 of the southern. The broad limits of the forest are determined to the west by the factor of decreasing rainfall; to the north and south by temperature. Within the region the optimum temperatures—a value more important than extremes—are to be found at elevations varying with the latitude from 500 feet (minimum) above sea level in northern New England to 3,500 feet (minimum) in South Carolina. Soil selection is seen most clearly in the Great Lakes region, where glacial clays are particularly favorable. Yet lighter, sandy soils are not avoided where there is exposure to moist winds, as in the southwestern corner of Michigan. On dry, sandy plains the type runs to one extreme—oak, hickory, and chestnut. The other extreme, the swamp lands with black ash, red and silver maple, and willow, is more distinctly southern and might be considered as an outlier of the southern type ("The Northern Hardwood Forest: Its Composition, Growth, and Management" by E. H. Frothingham, *U. S. Dept. of Agric. Bull. No. 285*, 1915). The forest has been one of the factors of profound importance in the progress of North American civilization. First barrier, then resource, something of the magnitude of its influence may be gleaned by simply noting the extent of forest removed. Originally the forest cover stretched practically unbroken from Maine to eastern Minnesota: now, including second growth, the forested surface is reduced to 60 per cent in New England, 43 per cent in Michigan and Wisconsin, and 35 per cent in New York and Pennsylvania. The greatest reduction has, of course, been in the soft woods. They were the exploiter's magnet. The hardwoods were principally removed for agricultural clearings, until the decline in softwood production gave them an increasingly important market. Since 1899 the cut of hardwood has also declined, though not so rapidly as that of the softwoods. Figures for 1912 show a relative increase in the proportion of the former of 28 per cent for Michigan, 24 per cent for Vermont, and 22 per cent for New York. Small increases are indicative of states where conifers still remain comparatively important—spruce in Maine, white pine in Minnesota, and hemlock in Pennsylvania.

The Danish West Indies. Location is a geographic factor of prime importance in the case of two of the West Indian islands, Curaçao and St. Thomas. As a refuge and revolutionary base Curaçao has figured in Venezuelan politics from the outbreak of the Wars of Independence. Political interest in St. Thomas, more spasmodic, is again to the fore with the revival of the half-century old project of the purchase of the Danish West Indies by the United States. The largest island of the group, Santa Cruz (St. Croix), is fertile and well adapted for its old business of sugar cultivation and its new one of cotton growing; but this is a matter of little weight beside St. Thomas' superb harbor and situation as the "Gibraltar of the American Mediterranean." Always a free port, open to the shipping of all nations, Charlotte Amalia has enjoyed its periods of prosperity. In the eighteenth century this neutral port gained its reputation as a collecting and distributing center for the islands. In the American Civil War it proved, like Nassau in the Bahamas, one of the most accessible West Indian ports for the blockade runners of the Confederacy. Decline came with the replacement of sail shipping by steam. Economic decline has been followed by decrease in population, to which the high infant mortality due to bad sanitation—said to be no less than 63.5 per cent (*The Independent*, March 6, 1916)—is a contributory and correlated cause. For the three islands of the group the population in round numbers was 43,000 in 1835, 30,000 in 1901, and 24,000 in 1914. The Danish West Indies thus present an absolute contrast to Porto Rico, where improved economic and hygienic conditions were followed by a rapid expansion of population (cf. the article on "Overcrowded Porto Rico" in the March *Review*, pp. 211-212). The measure of importance still retained by St. Thomas is due to its advantages as a coaling station (*Diplomatic and Consular Repts.*, Ann. Series, No. 5485, London, 1915). On the work incident to this depends the greater part of its 10,000 inhabitants, negroes from the British West Indian islands.

The West Indian Hurricane of August, 1915. Our records of West Indian hurricanes go back as far as the time of Columbus (1493). In all, nearly five hundred of these storms have now found their place in this long history. The origin of tropical cyclones is still open to debate. But their prognostics, characteristics, usual belts, and destructiveness are well known. Although all more or less alike, a careful study shows that each hurricane has individuality. Each one is therefore worth accurate charting and close scrutiny. The Gulf hurricane of August last, whose current history was fully reported in the daily papers, has been studied by Professor H. C. Frankenfield of the U. S. Weather Bureau (*Monthly Weather Rev.*, 1915, pp. 405-412). The storm center seems to have reached the west of Texas, near San Luis Pass, about 26 miles southwest of Galveston, about 1 A. M., August 17, shortly after which time a slow recurve to the north and northeast began. The lowest barometer reading at Galveston was 28.63 inches, with a maximum wind velocity of 93 miles an hour. At Velasco, Tex., the barometer fell to 28.06 inches, the lowest recorded during this storm. This is, of course, not by any means unprecedented. The diameter of the "eye" was about five miles. The loss of crops, buildings, railroads, shipping, and live stock was estimated at close to $50,000,000. Crops in fully one-half of Texas suffered severely. Damage by high winds was reported as far as the lower Ohio valley, especially over eastern Missouri. The greatest damage was, however, due to the floods resulting from the torrential rains which extended from Texas northeastward to New York. At Galveston, the famous "sea wall" (17 feet above mean low tide) which was built after the "Galveston storm" of September, 1900, to protect the city from flood damage caused by the Gulf waters, stood firmly and doubtless served effectively to prevent far more serious losses of life and property than actually occurred. Comparing the 1915 hurricane with that of 1900 it appears that the two storm paths were very similar. The wind velocities in these storms were not very different, and the effects were much the same, except as modified by artificial conditions in the vicinity of Galveston. Several illustrations of the damage done at Galveston and Houston and a number of special weather maps accompany Professor Frankenfield's paper. R. DEC. WARD.

SOUTH AMERICA

Fur Industry of South America. Chinchilla, nutria, jaguar, and puma are usually cited as the chief South American furs of commerce. To these may be added vicuña, fox, and seal. With the exception of jaguar and puma the fur-bearing animals of the land are limited to the highlands of Peru and Bolivia and the parts of Chile cool or temperate on account of their latitude or elevation. Trade in the furs of the cat tribe is exceedingly limited. Natives of the Chaco (Paraguay) are described as bartering these skins on the banks of the Paraguay River. In commerce the furs are likely be known as "South American lion."

Chinchilla is the distinctive and valuable South American fur. It was first introduced on the European market in the early nineteenth century and has lately gained in popularity to such an extent as to seriously threaten exhaustion of supply; prices have become correspondingly elevated. In 1901, Chile exported 385,740 skins valued at $805,391; in 1910, 50,000 valued at $1,000,000; in 1911, 37,000 valued at $750,000 (Chilean currency). The animal is hunted in the Bolivian and North Chilean Cordillera. From the provinces of Antofagasta and Arica, where it was formerly plentiful, it has totally disappeared; Vallenar and the north of Coquimbo are now the chief Chilean producing districts, and here it is reported that skins of a type valued at $10 in 1908 fetched $20 in 1910 and $30 in 1912. In some of the wilder and more inaccessible parts of Bolivia the chinchilla still exists in some numbers. The animal is hunted by the Indians, who commonly employ for the purpose dogs or ferrets which are trained to enter the burrows. The method entails destruction of the young but is a little less barbarous than the use of the dynamite or fire methods that also obtain. A *chinchillero* is endowed with unlimited patience; he will spend two, three or more months in securing as many specimens; however, some of the Bolivian hunters have made fortunes of £8,000 (P. Walle, Bolivia, pp. 370-371, Fisher Unwin, London, 1914).

During the last few years there has been a considerable agitation in Chile for chinchilla conservation. Its advocates urge prohibition for a short term of years, until this fecund animal shall have replenished the supply, and the adoption of such protective measures as a closed season during the breeding time and the exclusive use of proper traps for hunting (see Carlos Sage: "El esterminio de la chinchilla," *Bol. de Bosques, Pesca i Caza*, July, 1912, p. 27, Santiago de Chile. This periodical, which dealt chiefly with the conservation of the resources named in the title was published from 1912 to 1914, when it was suppressed by the Chilean government.) The sovereign method of conservation, however, is breeding. Some attempt at this has been made in Vallenar. On the farm of Sir John Murray the original stock of 500 chinchillas rapidly increased to 2,000 (see illustration in article by Isaiah Bowman, "Results of an Expedition to the Central Andes," *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 169). In captivity the chinchilla is a little smaller, but the fur is compensatingly fine and thick.

The chinchilla has been crossed with a member of the same family, the vizcacha, producing a fur which, though less valuable, has found a ready market as a substitute for the declining supply of chinchilla. Vizcacha itself is exported. In 1900 the trade was unknown; in 1911, over 250,000 skins valued at $17,667 were sent from Chile.

Formerly the great annual fairs of the Bolivian tableland were the collecting ground for the furs: but their importance has declined of late. Challapata, on the Oruro-Antofagasta railroad, 70 miles from the former city, had the best known fair and is said still to be the best place for buying chinchilla. Export, chiefly to Europe, is made through the ports of northern Chile from Coquimbo to Arica. Coquimbo and Antofagasta are the two principal ports of shipment. In 1913 chinchilla skins to the value of $14,034 (American) were sent to the United States from the consular district of Valparaiso (including Coquimbo), but no figures are given for 1914. In the latter year Iquique dispatched $3,893 worth to the same destination (*Suppl. to Commerce Repts.*, Ann. Series, No. 41a, 1915, Washington).

Of the members of the "South American sheep" family—llama, alpaca, guanaco, vicuña—only the last has value as an export skin. Guanaco skins are largely used by the Patagonian natives; llama and alpaca are valued for their wools. The natives have engaged in communal hunts from time immemorial; these are described in much of the South American travel literature. A short article by Charles W. Furlong entitled "Hunting the Guanaco" appeared in the *Outing Magazine* for October, 1912. Today on the European market vicuña skins, used as rugs, fetch £4 or £5 apiece.

The nutria (*coypu*), similar to the American musk rat, is hunted along the watercourses of southern Chile. With otter and fox it is chiefly exported from the center and port of the South Chilean fur trade, Punta Arenas. The "Censo Jeneral del Territorio de Magellanes," Punta Arenas, 1908, gives some export statistics. Prohibitions of seal hunting in northern waters have turned attention to the inferior seals of the southern seas. Seals are common along the Peruvo-Chilean and Argentine coasts, but the better species is found south of 46° S. Such skins conserved in slat are exported to England at the mean price of £5 each. The principal Chilean company, Compañia Austral de Pesquerin, has its headquarters in Punta Arenas. Conservation is being urged for the seal as well as the chinchilla. In 1901, 3,306 fine seal skins valued at $35,899 (Chilean) were exported from Chile; in 1911, 2,612 valued at $67,912. Other statistics are given in "Estadística Comercial de la República de Chile," Santiago de Chile, 1914. Uruguay also has interests in seal fishing. (See also article "Furs in the Americas," *Bull. Pan American Union*, Vol. 28, No. 2, February, 1914.)

Argentine Labor and the War. It is many years since Alberdi said "to govern is to people," and yet today Argentina has a population of under seven to the square mile. The Government, it is true, encourages immigration and by new colonization laws framed on the homestead plan is endeavoring to fix the immigrant to the soil. At present fully 25 per cent of the total immigration is of the *golondrina* type, upon which the country depends very largely for its harvesting. It has been estimated that at the end of the season the average harvester is able to return to his home in southern Europe with $150 in his pocket. This source of labor has been hard hit by the war (*The South American Journal*, Dec. 18, 1915). Only 26,800 immigrants had arrived by the end of October, 1915, and 96,000 persons, including 34,000 reservists and volunteers, had left the country. To lighten the harvesting difficulty the railroad companies have been requested to reduce their charges for transportation of labor destined for the purpose.

The Argentine Meteorological Service. The Argentine Meteorological Service was established in 1872, under the direction of Dr. B. A. Gould, the founder of the Astronomical Observatory at Córdoba. Doctor Gould continued in charge of the Service until towards the end of 1884, when he left Argentina. He had established 52 meteorological stations; had secured the publication of four volumes containing discussions of the observations; had constructed isothermal charts whose essentials have not been greatly altered by any later work; and had collected rainfall data which, for the first time, showed the distribution of precipitation over the southern portion of South America. In 1885, Mr. Walter G. Davis, a native of Vermont, succeeded Doctor Gould and continued at the head of the Service until his retirement last year, after thirty years of active work in that position. Under Mr. Davis' able direction, the Argentine Meteorological Service attained a position in the very front rank of all the government meteorological services of the world. The publications have been numerous, and all of them of recognized high standard. Among the many activities of this Service may be mentioned the taking over, in 1904, of the meteorological and magnetic station at Laurie Island, in the South Orkneys, which had been established in the previous year by the Scottish Antarctic Expedition. Under conditions of extreme loneliness and of great hardship, the observers at this remote outpost have maintained their records faithfully for eleven years—a series of observations of the greatest importance in the study of world meteorology. (See the note on the "Climate of the South Orkneys," under "Polar," below.)

With the Laurie Island station (lat. 60°43′ S.), the Argentine Meteorological Service extends over nearly 40° of latitude. It has 42 first class, 162 second class, 12 third class, and 1,930 fourth class stations. The 8 A. M. and 8 P. M. observations from 190 stations are used in constructing the daily weather map, besides the rainfall record from about 1,350 rainfall stations.

A recent publication of the Argentine Meteorological Service (1914) gives, in Spanish and in English, the history and organization of the Service, and includes a concise and useful summary of the results, by climatic provinces; a discussion of the atmospheric circulation and the weather of Argentina, by H. H. Clayton, now Chief of the Department of Forecasts, formerly at Blue Hill Observatory, and an excellent series of climatic charts, which give all the essentials of Argentine climatology. This publication is an inspiring record of splendid work, well planned, thoroughly organized, and ably carried out. Mr. Davis, the retiring Director, who is now in the United States, has well earned the rest and the relief from the heavy responsibilities which, as head of one of the world's best meteorological services, he has carried for thirty years.

R. DEC. WARD.

ASIA

Reforestation in China. China is awakening to the necessity of protecting her treeless hills and plains. The forest situation in the country is well-nigh hopeless. Since trees have vanished floods have become common. To a population sunk in deepest poverty the only form of fuel available is timber cut within proximity of the home. The climate of the greater part of the country is such that fuel is as necessary for warmth as for cooking. The needed forest products must be imported, and this the Chinaman cannot afford. He is therefore beginning to realize that his neglect of his country's forests accounts largely for his low standard of living and that with an abundant supply of lumber and timber his comfort, health, and earning capacity would be increased.

W. F. Sherfesee, Director of Forestry in the Philippine Islands, contributes to the November number of *American Forestry* (Vol. 21, 1915, pp. 1033-1040) an account of

the action undertaken by a number of influential Chinese and by the University of Nanking to carry on extensive work in reforestation. A school of forestry has been added to this institution and a beginning made in actual tree planting on the slopes of Purple Mountain nearby.

There is reason to believe that forest planting on a large scale on the idle lands of China would be highly profitable. Large tracts of excellent land are now lying waste with an overcrowded and desperately poor population in their vicinity. Soil and climate are eminently fitted for the purpose. Labor is abundant and cheap. It can be made efficient by proper instruction. In comparison with situations in which reforestation has been successfully carried out in the United States, the conditions in China are extremely favorable.

Most of the Chinese idle lands belong to the state. A portion of their total area is well adapted to agricultural and fruit-growing purposes. The orchards occasionally met with show that it is possible to make these lands yield satisfactory results. But by far the largest part of unused lands is suited only to the production of fuel and timber. Steps should therefore be taken to encourage the owners of private land to plant profitable trees and get public lands into private ownership for the same purpose. The Chinese government cannot shoulder the financial burden of extensive reforestation. But much can be accomplished by private enterprise. It is the citizen himself who must feel sufficiently interested in the welfare of his country to undertake seed distribution and the establishment of nurseries.

The reforestation undertaken on Purple Mountain affords an excellent example of what can be accomplished by means of a little care and industry. The work was originally undertaken to relieve a famine-stricken community. Many of the destitute members were assigned to the task of building roads around the mountain. The rich land at its base was turned into a crop-yielding area, and the bare slopes were planted with young trees. The assistance thus rendered to countless Chinese who were homeless and destitute had the twofold advantage of meeting their immediate necessities and of providing some of them with a permanent livelihood. Many families now enjoy a comfortable home on the land made productive by tree planting.

Irrigation in India. The contrasts and resemblances in methods and results of irrigation in India and the United States are of peculiar interest at the present time when there is a temporary lull in development. The renewal of activity in our arid West, which must come about in due time, should be accompanied by a better appreciation of some of the lessons taught by Indian experience.

A recent short article in the *Geographical Teacher* (No. 42, Vol. 8, 1915, Part 2, pp. 118-124) points out the dependence of irrigation development in India upon geographic and topographic conditions and shows how from the beginnings of the old primitive wells watering a few acres there has been a growth, in the northern plains, of the net-work of canals and, in the southern plateau, a multiplication of the many reservoirs and small works, each type being adapted to its topography.

The reservoirs—some of great antiquity—are almost innumerable. They consist essentially of earthen tanks formed by building a series of banks around a depression in the ground or by erecting an obstruction to the outlet of a small valley. They vary in size from a few acres to several thousand acres. The more modern higher dams, instead of being of earth, are sometimes built of masonry, but as a rule the construction is of very simple type. When one reservoir is filled with sediment in the course of time, another is constructed either above or below it, and the surface of what was the older reservoir is converted into cultivated fields.

The most picturesque works, however, are the great canals of the northern plain; in magnitude they far exceed many waterways built in other parts of the world. They are in effect artificial rivers which have been constructed, in many cases, to cross the natural watercourses on huge aqueducts. Occasionally they dive under such channels, re-appearing on the opposite side. In building these works, the topography of the country is in general favorable, but many obstacles must be overcome, due to minor irregularities. The silt difficulty is usually present and necessitates the planning of the works in such a manner as to send the excess of silt downstream and to carry a certain proportion of the finer material out upon the land, where it adds to the soil fertility.

F. H. NEWELL.

Recent Progress on the Bagdad Railroad. The construction of the Bagdad Railroad east of the Euphrates has been pushed vigorously since the war began. In February, 1915, the railhead had reached Tel-el-Abiad, a distance of 37 miles east of the river (C. Rabot, *La Géogr.*, Vol. 30, July, 1915, p. 288). A few months later, on July 23, 1915, the line was opened to traffic as far as Ras-el-Ain (*Board of Trade Journ.*, No.

986, Vol. 91, October 21, 1915, p. 205), a distance of approximately 80 miles farther. It is thus shown on the map facing page 288 of this number of the *Review*. Since then the construction has been completed as far as Nesibin, about 65 miles beyond (*Near East*, March 10, 1916, p. 1). On the southeastern end of the line practically no advance has been recorded beyond Samara since the late summer of 1914. This should dispose of the rumor which had been circulated concerning the completion of the line (see note on "Land Route to India" in the March *Review*, p. 221).

Harbor Improvements at Cebu. According to the *Weekly Commercial News* of San Francisco (September 18, 1915) the improvement of the port of Cebu, Philippine Islands, was being rapidly advanced by the Bureau of Public Works. It was estimated that the work would be completed in November. This improvement will make Cebu one of the best equipped ports in the Philippines, with 3,000 feet of concrete sea wall, berths for two steamers drawing 30 feet, a fifty-ton crane, and all approaches asphalt-paved.

AUSTRALASIA AND OCEANIA

Geologic Problems of the Pacific Islands. In an address delivered before the American Association for the Advancement of Science at the San Francisco meeting, 1915 (Problems of the Pacific Islands, *Amer. Journ. of Sci.*, Vol. 41, 1916, pp. 154-186) Professor Reginald A. Daly outlines some of the geologic problems awaiting the scientist in the rich field of the Pacific islands. Two fundamental problems, vulcanism and coral reef formation, are briefly discussed in relation to the author's own theories. In respect of vulcanism Daly says "volcanoes are the surface expressions of great, molten, basaltic wedges locally thrust up into the solid crust. The pulsing life of a volcano is dependent on the size, gas content, and thermal energy of its feeding wedge. Since each wedge is of limited length, width, and height, ultimate extinction of every volcano is to be expected." He adduces supporting data from the preponderatingly basaltic and related lavas in the Hawaiian and other Pacific islands of which the petrography is known at least in part, and from recent work on Kilauea, a magnificent locus for the study of active vulcanism. Accumulating data on the coral island problem emphasizes the inadequacy of the Darwinian subsidence theory. Most seriously the famous theory fails to explain the feature, universal throughout the Pacific and Indian Oceans, of smooth lagoon floors at depths nowhere exceeding 300 feet and averaging 150 to 250 feet, and their entire discordance with the wall-like reefs of coral. Daly's glacial-control theory regards all existing reefs as post-glacial and built up on wave-cut platforms, the development of which would be comparatively rapid when protective coral growth was inhibited by too cool ocean temperatures. The depth of the platforms is in accordance with the hypothetical depth required by the post-glacial raising—180 feet—of the level of the tropical seas, plus the limits of effective wave cutting. Similar platforms are encountered outside the coral areas. From this point of view the Great Barrier Reef of Australia is to be regarded as a coral veneer on the northerly part of the continental shelf. But investigation of the problem is only beginning; quantitative and qualitative studies must be carried out in the determination of such aspects as the age and resisting powers of the volcanic islands; the erosive powers of ocean waves and currents; the degree and nature of reef-protection, involving biological and paleontological study of reef fauna; and the topographical characteristics of reef and platform.

Life on the Islands of the Mid-Pacific. Interesting glimpses of the life of the South Sea islander are presented by Dr. Alfred Goldsborough Mayer in one of a series of articles on Polynesia he has recently been contributing to *The Scientific Monthly* (The Islands of the Mid-Pacific, Feb., 1916, pp. 125-149). In spite of their picturesque appearance, the atolls, low-lying and mournfully flat, ill-watered and rarely exceeding one-eighth of a mile in width, harbor the most backward of mid-Pacific populations. So defective is the water-supply that the liquid is as precious to the atoll-islander as it is to the Arab of the desert. "To obtain it, the natives cut furrows extending diagonally down the stems of cocoanut palms and leading into a cavity cut in the trunk of the tree, within which a few ounces may collect. Failing of the meager supply they resort in time of drought to the mosquito-haunted swamps, which occur here and there in the center of the islet."

On the large masses of continental rocks such as New Caledonia, as well as on the mid-tropical volcano-islands or the elevated limestone reefs, conditions far more favorable to the development of mankind prevail. The highest culture is therefore restricted to these types. In the protection of the shallow channels between the barrier reefs and the shore, the natives derive an abundant supply of fish for sustenance. The morrow is provided for, and ample leisure under balmy climes marks their lot.

The devastating effects of hurricanes which visit the islands once or twice in a generation bring no lesson to the careless inhabitants of the Southern Seas. Although villages and settlements are literally swept clean, no effort to construct hurricane-proof houses has ever been made, according to Doctor Mayer. The vision of life he conveys in these pleasing lines reveals a careless and resigned attitude of adaptation to natural circumstances on the part of the natives.

OCEANS

Search for Doubtful Islands in the Southern Pacific by the "Carnegie." In the course of the *Carnegie's* circumnavigation of the globe between the fiftieth and sixtieth parallels of south latitude, the Pacific section of which she has just completed, having arrived at South Georgia on January 12 from Lyttelton, New Zealand, which was left on December 6, 1915, a search was made for two islands or island groups which had been reported in the first half of the nineteenth century but whose existence seemed doubtful (*Terrestr. Magnet. and Atmosph. Electr.*, March, 1916, pp. 26-27).

The first of these, the Nimrod Islands, were stated to have been seen by Capt. Henry Eilbech in the ship *Nimrod* in 1828 on her passage from Port Jackson to Rio de Janeiro. The group was placed by him in about 56½° S. and 158½° W., having been seen at a considerable distance. Captain Biscoe sought for the group in 1831 on his Antarctic trip, but the search was ineffectual (A. G. Findlay: Directory of the South Pacific Ocean, 5th edition, revised to 1900). The *Carnegie* would have passed over the charted position of the islands if the wind had not shifted twelve hours too soon. Because of this her course did not bring her nearer than 40 miles. More definite information was gained as to the existence of the other island, Dougherty Island. Dougherty Island was supposed to have been seen by a whaling vessel, the *James Stewart*, Captain Dougherty, on May 29, 1841. The position was only determined approximately, as 59° 20′ S. and 120°20′ W. On September 4, 1859, Capt. E. Keates, of the *Louise* of Bristol, on his passage from Melbourne to St. John, New Brunswick, sighted an island in 59°21′ S. and 119°7′ W. (Findlay, *op. cit.*). As his observations were good, it has generally been assumed that he saw the same island as Captain Dougherty, and Dougherty Island has therefore been generally charted according to Keates's position. On December 25 the *Carnegie* was in the vicinity of the position given for the island. The commander himself went aloft every half hour. Nothing could be seen from the masthead. From here the island, with its reputed height of 80 feet, should have been visible if anywhere within 30 miles of the vessel. Finally, the *Carnegie* passed within 3 miles of the alleged position without seeing any sign of land. It thus seems highly probable that the island does not exist.

An explanation of the cause of this and similar illusions is offered by an incident which occurred on the *Carnegie's* cruise. One afternoon the cry of "land ahead" went up, and what appeared to be a bold, dark rock island was seen. The course was immediately shaped to pass near it. What seemed a rocky cliff, capped with snow, became visible. Nearer approach, however, proved that the supposed island was an iceberg, 225 feet high by a quarter of a mile long. The light was reflected from the perpendicular ice-wall in such a way as to give to the berg the appearance of a huge, dark rock. Some such deception may underlie the reports of the existence of an island in these waters. Indeed, Captain Keates passed several icebergs before sighting the alleged island. He reported an iceberg aground on it whose orientation to the prevailing wind, which was in contrast to that of the other icebergs, confirmed him in his belief that what he saw was an island and not an iceberg. However, he emphasizes the dark color of the island, a criterion which the *Carnegie's* experience has shown to be precarious.

In addition there is always the possibility of a mirage. This is attested by another experience on this cruise of the *Carnegie*, when what appeared to be extensive land was distinctly seen in the direction of Banks Peninsula, at a time when the vessel was 190 miles distant from this prominent projection of the South Island of New Zealand. Similarly, Peary's belief in the existence of Crocker Land has been shown to be based on a mirage. The very party that proved this experienced how persistent a phenomenon it is, for, before reaching the reported position of the land, MacMillan and his companion were also deceived by the phantom.

Current belief in the non-existence of the Nimrod group and Dougherty Island is also reflected on the chart of the Southern Pacific Ocean issued by the U. S. Hydrographic Office (No. 824), on which the designation "position doubtful" on the original edition of 1883 has been changed to "existence doubtful" on the latest revised edition, that of 1912; and on the Prince of Monaco's standard Carte Générale Bathymetrique des

Océans, on the current, second, edition of which (1914) the islands have disappeared entirely, although they were shown on the first edition (1905).

The search for the Nimrod group and Dougherty Island were only incidents in the cruise of the *Carnegie*. In spite of trying weather conditions, the magnetic declination was observed on an average twice daily during the entire trip. The total run from Lyttelton to South Georgia was 5,440 miles, covered in 40 days. The *Carnegie* has thus completed a little less than half of her circumnavigation of the globe in subantarctic waters, the purpose of which it is to amplify the scant data extant on the terrestrial magnetism of these regions.

POLAR

Climate of the South Orkneys. The meteorological and magnetic station established by the Scottish Antarctic Expedition, under Dr. W. S. Bruce, on the South Orkneys, was taken over by the Argentine Government in 1904, and has been maintained since that date as a part of the Argentine Meteorological Service. The personnel of this lonely outpost is relieved once each year, in January or February, when supplies are left for the remaining twelve months. The men are then completely isolated, without mail or cable communication, until the relief vessel returns the following year. It is under these conditions that the observations have been carried on for over eleven years. Volume 16 of the *Annals of the Argentine Meteorological Service* contained the data for 1904. Volume 17 (1912-1913), in two parts, contains the continuation of the observations to the end of 1909. The first part includes the hourly meteorological observations in their yearly sequence; the second, the compilation and discussion of the results from the commencement of the series (March, 1903), and the magnetic observations. The record is a remarkably complete one and, printed *in extenso*, fills two good-sized volumes, numbering over a thousand pages and weighing over eleven pounds. It is a fine record of important scientific work, carried on under conditions of loneliness and hardship. Death has come, more than once, to the little party of observers at their distant post of duty.

The climate of the South Orkneys has many features of interest. The presence or absence of pack ice in the surrounding oceans causes great variations in the monthly, seasonal, and annual temperatures. In some years the climatic features are those that pertain to a continental situation, and in others marine conditions prevail. The islands are situated in the direct track of an Antarctic current, and this, even when no ice is present, brings a constant supply of ice-cold water past the group. The mean annual temperature is 24° Fahr.; the coldest month is July, with 106°; the warmest is February, with about 33°. Hence the mean annual range is about 22.5°. The absolute minimum is —40.2°. The absolute maximum is 47.8°. Apart from foehn influences, the temperature even in summer seldom rises more than 5° to 8° above freezing. A change of wind from an equatorial to a polar quarter, or vice versa, is accompanied by a large change of temperature. The southerly winds, blowing from the continental ice sheet, are the coldest. "Frozen fogs" and snowdrifts make it very difficult to keep the wet-bulb thermometers in condition. A minimum relative humidity of 35 per cent was recorded during a foehn. The maximum hours of sunshine recorded in any month was 120. There are, on the average, 188 sunless days in the year. The mean annual cloudiness is 8.5, the South Orkneys being thus situated in one of the most cloudy regions in the world. For the year the prevailing direction of the cloud motions is west (30 per cent); followed by southwest (27 per cent). The mean hourly velocity of the wind is 13 miles. One storm lasted 37 hours, with a mean wind velocity of nearly 45 miles an hour, and a maximum velocity of 69 miles. Snow falls on the average on 254 days in the year; rain on 113; hail on 27. The mean annual precipitation is 17.60 inches. The maximum depth of snow (end of November usually) is 25.75 inches. The maximum depth recorded was 40 inches. Dew is rarely experienced, since in the calm, clear weather required for its formation, the temperature, even in summer, nearly always falls below freezing, so that hoar frost is deposited. The very rare thunderstorms are nocturnal.

R. DEC. WARD.

PHYSICAL GEOGRAPHY

Radioactivity and the Solution of Problems of Geological Time. Radioactivity affords science a new medium for the measurement of the age of the earth. The discovery of the constant emission of heat by radioactive minerals has necessitated a revision of the physicist's determination of the age of the earth based on the rate of cooling. Uranium and thorium in the rocks of the earth's crust must be considered as the supply according to Arthur Holmes (Radioactivity and the Measurement of

Geological Time, *Proc. Geologists' Assoc.*, Vol. 26, 1915, Pt. 5) of at least three-quarters of the total terrestrial heat. Retaining Kelvin's assumption of an initially molten surface, in no wise negatived by the principles of radioactivity, the age of the earth must then be increased to not less than 1,600 million years. The other phenomenon of importance in this connection is the evolution of stable products, helium and lead, by the disintegration of the unstable uranium and thorium. Radioactive minerals contain derivative helium and lead in amounts proportional to their age. The rates of chemical transformation have been established; hence, if the amount of the derived element be determined, the age of the containing mineral is known, assuming that it was free from original helium or lead at the time of genesis and that none of the derived product has been subsequently lost. In the case of helium the latter condition is never fulfilled: the element is slowly lost by dissipation; consequently the determination of helium will only give minimum age. More satisfactory results are obtained from the determination of lead. Provided that the radioactive mineral is free from original lead and from alteration products of contact generation the proportion of lead to uranium will be a constant whose value is determined by its age; the older the mineral the larger the lead ratio. For the establishment of geological age where the ordinary data are scant or lacking, as in the case of the pre-Cambrians and of many igneous intrusives, this radioactive method should prove of great value.

GEOGRAPHICAL NEWS

Present Plans of the U. S. Geological Survey for Field Work in Alaska. In accordance with plans approved by Secretary of the Interior Lane, the investigation of the mineral resources of Alaska by the U. S. Geological Survey will be continued this year by twelve parties. Congress has recognized the necessity of preparing in advance for the survey of this difficult field by including the appropriation for its continuation in the Urgent Deficiency Act, which was approved on February 28. This prompt action makes it possible to plan the work in advance of the opening of the field season and to carry out the plans efficiently and economically.

The work to be done this year includes a detailed survey of the region tributary to Juneau, which is the most important quartz camp in Alaska. A continuation of the study of the mineral resources of the Ketchikan district, where there are important gold and copper mines, is also planned. The investigation of the water powers of southeastern Alaska will also be continued. Only one party will be employed in the Copper River region. Two parties will work in Prince William Sound.

Four parties will make surveys in the region directly or indirectly tributary to the government railroad under construction (cf. *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 924). One of them will study the new Tolovana placer district and also make some supplementary investigation of the Fairbanks lode district. The geologist of this party will later visit the Nome district. A detailed geologic survey will be made of the western part of the Nenana coal field, which is adjacent to the route of the government railroad. Two other parties will be employed in carrying reconnaissance surveys westward from the railroad route to the Kantishna placer and lode district. It is also proposed to make surveys of the lower Yukon, including the Marshall placer district (*U. S. Geol. Surv. Press Bull. No. 233*).

Addition of Geography to the Curriculum of the University of Michigan. With the opening of the academic year 1915-16, geography has been formally added to the work in geology at the University of Michigan, the name of the department being changed to Department of Geology and Geography. Geography has also been made one of the subjects open to election by freshmen in the College of Literature, Science, and the Arts and continues through the year four times weekly, the work of the first semester being devoted to physiography and that of the second semester to anthropogeography. The work in physiography is conducted as heretofore by Assistant Professor Irving D. Scott, and Carl Ortwin Sauer, Ph.D. (University of Chicago), has been appointed instructor in geography. About 150 students have been enrolled in the freshman course, and a course in commercial geography given during the present semester has been elected by 115 students, showing plainly the need for such training at the university.

During the coming summer session of the university there will be included geography work in charge of Doctor Sauer, and in the next academic year, in addition to freshman work and the course in commercial geography, courses in the Geography of North America and Geographic Influences in American History will be offered.

During the present academic year a series of illustrated lectures by non-resident lecturers is being delivered to popular audiences in the new auditorium of the Natural

Science Building. The following have already been given: Miss Dora Keen, Philadelphia, "The First Ascent of Mount Blackburn," November 11, 1915; Dr. Ellsworth Huntington, Milton, Mass., "Weather, Work, and Human Activity," December 2, "The Ideal Climate and the Distribution of Civilization," December 3, "The Past Distribution and the Cause of Climatic Changes," December 3; Professor R. H. Whitbeck, University of Wisconsin, "Some Geographical Influences upon the Trend of Civilization," February 24, 1916, "The Reclamation of Desert Lands," February 25; Professor Walter S. Tower, University of Chicago, "Northern Chile and the Nitrate Industry," March 10, "A Journey Through Argentina," March 10; Miss Ellen Churchill Semple, Louisville, Ky., "The Barrier Boundaries of the Mediterranean in the Present War," March 31, "Geographic Influences in Japan," March 31. The topics of the lectures still to be given are: Professor J. Russell Smith, University of Pennsylvania, "Tree Crops and Conservation," April 21, "The Desert and the Desert's Edge," April 21; Dr. Edward L. Stevenson, Secretary, The Hispanic Society, New York City, "The Expansion of Geographic Knowledge in the Middle Ages and Its Record as Given by the Map-Makers," May 4; "Early Discovery and Exploration in the New World as Represented by Contemporaneous Map-Makers," May 5.

Centennial Exercises of the U. S. Coast and Geodetic Survey. The hundredth anniversary of the founding of the U. S. Coast and Geodetic Survey was celebrated in Washington with appropriate ceremonies on April 5 and 6. In addition to the varied program of addresses listed below, there was an exhibitit at the New National Museum illustrating the work of the Survey. Surveying instruments and appliances, pictures of surveying operations and equipment, and charts and the publications of the Survey were shown. As far as possible the earliest instruments and appliances were exhibited beside those now in use, and the earliest available maps and charts of the United States were shown in comparison with the present charts issued by the Survey. The exercises terminated with a banquet at the New Willard Hotel on April 6 at which the President of the United States, the Minister of Switzerland, the Secretary of the Navy, the Secretary of Commerce, and Dr. T. C. Mendenhall were the speakers.

The papers read at the scientific sessions included a number by the heads of various interested government bureaus on the work of their respective organizations and its relation to the work of the Survey. The following heads of bureaus spoke: Dr. George Otis Smith, Director of the U. S. Geological Survey; Brigadier General W. M. Black, Chief of Corps of Engineers, U. S. Army; Hon. George R. Putnam, U. S. Commissioner of Lighthouses; Dr. Hugh M. Smith, U. S. Commissioner of Fisheries; Dr. S. W. Stratton, Director of the U. S. Bureau of Standards.

The remaining speakers and their subjects were: Dr. Douglas Wilson Johnson, Associate Professor of Geology, Columbia University, "The Contribution of the U. S. Coast and Geodetic Survey to Physical Geography"; Rear Admiral J. E. Pillsbury (Retired), U. S. Navy, "Ocean Currents and Deep Sea Explorations of the U. S. Coast and Geodetic Survey"; Dr. Charles Lane Poor, Professor of Celestial Mechanics, Columbia University, "Oceanic Tides, With Special Reference to the Work of the U. S. Coast and Geodetic Survey"; Mr. George Washington Littlehales, Hydrographic Engineer, U. S. Hydrographic Office, "Hydrography and Charts, With Special Reference to the Work of the U. S. Coast and Geodetic Survey"; Dr. Louis A. Bauer, Director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, "The Work Done by the U. S. Coast and Geodetic Survey in the Field of Terrestrial Magnetism"; Prof. William Henry Burger, Professor of Civil Engineering, Northwestern University, "The Contribution of the U. S. Coast and Geodetic Survey to Geodesy"; Hon. J. Hampton Moore, Member of the U. S. House of Representatives, "The U. S. Coast and Geodetic Survey's Part in the Development of Commerce"; Rear Admiral Richard Wainwright (Retired), U. S. Navy, "The Civil War Record of the U. S. Coast and Geodetic Survey, and What the Survey Is Doing Towards Preparedness"; Dr. Otto Hilgard Tittmann, President of the National Geographic Society, "The International Work of the U. S. Coast and Geodetic Survey."

The Coming Session of the National Conservation Congress. This year's session of the National Conservation Congress will be held in Washington, D. C., May 2-4. The subject for discussion is "The Conservation of National Strength and Efficiency." Among the leading topics for consideration are: "Know America," "Americanization," "Mobilization of Resources," and "Educational Preparedness," About five hundred persons are at work in the various committees of the congress drafting reports which will be presented for consideration. These committees cover such subjects as mineral fuels, iron, soils, water power, nitrate and phosphate preparedness, forests, wild life, cotton, wool, sugar, cattle, irrigation, manufactures, trans-

portation, human resources. The officers are as follows: President, E. Lee Worsham, Atlanta, Ga.; Vice-Presidents, Dr. Henry S. Drinker, South Bethlehem, Pa., and Mrs. Percy V. Pennybacker, Austin, Tex.; Treasurer, Norman C. McLoud, Cleveland, Ohio; Chairman, Executive Committee, Dr. G. E. Condra, Lincoln, Nebr.; Executive Secretary, Thomas R. Shipp, Washington, D. C.

Personal

Mr. Roy C. Andrews, assistant curator of mammalogy at the American Museum of Natural History, left on March 17 for a zoölogical expedition to China under the auspices of the Museum. The field of study will be the province of Kwei-chau, which will be reached via the Sikiang River.

Dr. L. A. Bauer, director of the Department of Terrestrial Magnetism of the Carnegie Institution, gave an illustrated lecture on February 26 before the Brooklyn Institute of Arts and Sciences on "The Earth, A Great Magnet." The subject-matter was essentially the same as that of Doctor Bauer's address at the first joint meeting of the American Geographical Society and the Association of American Geographers, which was printed in the July, 1914, *Bulletin* (Vol. 47, pp. 481-499) of our Society.

Prof. Charles P. Berkey, of the Department of Geology at Columbia University, has been granted a leave of absence for the winter session of the academic year 1916-17.

Dr. Fay Cooper Cole, assistant curator of anthropology in the Field Museum of Natural History, Chicago, spoke on March 28 before the Brooklyn Institute of Arts and Sciences on "Wild Tribes of the Philippines."

Mr. J. S. Diller, of the U. S. Geological Survey, on March 13 addressed the Physiographer's Club at Columbia University on "Lassen Peak, Our Most Active Volcano."

Mr. S. V. Gibson, district commercial manager of the New York Telephone Company, gave an illustrated lecture on February 28 before the Brooklyn Institute of Arts and Sciences on "The History of Communication."

Dr. M. A. Howe, curator of the museums of the New York Botanical Garden, spoke on March 14 before the Torrey Botanical Club on "Reef-Building and Land-Forming Algæ."

Prof. Harold Jacoby, of the Department of Astronomy of Columbia University, gave a lecture on March 6 before the Columbia University Institute of Arts and Sciences on "The Earth's Rotation" at which the Foucault experiment was repeated. He also lectured on February 24 before the Brooklyn Institute of Arts and Sciences on "Navigation, or How Ships Find Their Way Across the Ocean."

Prof. Douglas W. Johnson, of Columbia University, repeated his lecture on "The Surface Features of Europe as a Factor in the War," on March 2 before the Washington Academy of Sciences. He has been giving a popular course of three lectures on the "Interpretation of Scenery," both before the Brooklyn Institute of Arts and Sciences and the Columbia University Institute of Arts and Sciences. The subjects of the individual lectures, which were given mainly in March, were "Plains and Plateaus," "Mountains," and "Volcanoes."

Prof. A. L. Kroeber, of the University of California, spoke on February 28 in New York before the American Ethnological Society on "The Zuñi Clan."

Dr. Willis T. Lee, of the U. S. Geological Survey, read a paper on March 20 before the New York Academy of Sciences on "Application of Physiographical Methods to the Correlation of Non-Marine Formations in the Rocky Mountains."

Prof. C. T. Macfarlane, professor of geography in Teachers College, Columbia University, has been granted leave of absence for the winter or spring session of the academic year 1916-17.

Baron Erland Nordenskiöld, the Swedish anthropologist, spoke before the Berlin Anthropological Society on April 17, 1915, on the results of his latest expedition in the boundary districts of Bolivia and Brazil.

Dr. Ida Helen Ogilvie, of the Department of Geology of Barnard College, has been promoted from assistant to associate professor.

Dr. K. T. Preuss, of the Berlin Museum of Ethnography, was engaged, according to last reports, in an ethnographical expedition to the Arhuaco Indians of the Sierra

Nevada de Santa Marta in Colombia, a tribe related to the ancient Chibchas, whose language and customs they have in part retained.

KNUD RASMUSSEN, the Danish explorer, has completed plans for a new expedition to northern Greenland on which he will start early in the spring, according to press despatches. He will explore the region where Peary Land—a peninsula and not an island, as Mylius Erichsen's expedition proved—joins the mainland, especially Independence Fiord, on the east, and Nordenskiöld Inlet and Sherard Osborn Fiord on the west. He will be accompanied by Peter Freuchen as cartographer and Lange Kock as geologist.

DR. EMILIA SNETHLAGE, of the Museu Goeldi of Para, Brazil, has returned from another expedition to the region between the middle reaches of the Xingú and Tapajoz, which she explored in 1909 (cf. references in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 717 and 870, and Vol. 46, 1914, p. 228). She again ascended the Iriri, an important left affluent of the Xingú, and the Curuá, the main tributary of the Iriri. On the Curuá she reached 9° S. latitude, two and a third degrees farther upstream than on her 1909 expedition. Doctor Snethlage brought back important ethnographic collections from the Indians living along these watercourses, the Chipayas and the Curuahés. On the upper Curuá Doctor Snethlage lost a finger through the bite of a *piranha*, the "man-eating" fish described so graphically in Colonel Roosevelt's account of his Brazilian trip.

MR. R. R. STEWART spoke on February 22 before the Torrey Botanical Club on "The Agriculture of the Punjab, India."

ARCHDEACON HUDSON STUCK gave an illustrated lecture on March 10 before the Geographic Society of Chicago on "The Ascent of Mt. McKinley." Archdeacon Stuck, it will be remembered, made the first complete ascent of this, the highest known peak in North America (see *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 204).

OBITUARY

DR. C. WILLARD HAYES, whose untimely death occurred on February 9 at his home in Washington, D. C., was one of the early workers who contributed most significantly to the organization and development of the modern science of physiography in this country. A graduate of Oberlin and of Johns Hopkins University, and with wide field experience in Alaska and Nicaragua as well as in the United States, he had an unusual background against which to project and test out the theories of physiography. Doctor Hayes's contributions to geology and economic geology were very many, through his lifelong association with the U. S. Geological Survey as geologist and later as chief geologist.

In all his significant papers his interest in physiography is clearly shown, for its problems were ever present in his mind. His most constructive contributions, because of their strength, foresight, and opportuneness, were his paper on the "Geomorphology of the Southern Appalachians," written in association with Marius R. Campbell (*Natl. Geogr. Mag.*, 1894-95, pp. 63-126; summarized by Hayes alone in "The Southern Appalachians," National Geogr. Monographs, pp. 305-336, Amer. Book Co., New York, 1896), and his "Physiography of the Chattanooga District" (*19th Annual Rept., U. S. Geol. Survey, 1897-98*, Pt. II, pp. 1-58). It was a fortunate thing for the science that Dr. Hayes's life for many years was given to the study of the Southern Appalachians, so rich in physiographic problems. His work was constructive and lasting, and his reputation as one of the makers of physiography will be permanent.

RICHARD ELWOOD DODGE.

SIR ARTHUR RÜCKER died on November 1, 1915. His magnetic surveys of the British Isles, in conjunction with Sir Edward Thorpe, for the epochs 1886 (published in 1890) and 1891 (published in 1896) are of geographical interest.

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in the January number, pp. 57-61

NORTH AMERICA

UNITED STATES

General

WOODSON, C. G. **The Education of the Negro Prior to 1861: A History of the Education of the Colored People of the United States from the Beginning of Slavery to the Civil War.** 454 pp. Bibliogr., index. G. P. Putnam's Sons, New York, 1915. $2. 8 x 5½.

The book is a clearly written and somewhat detailed account of negro education in America from early colonial days to the War of Secession. The facts are grouped around the well-sustained central thread of the white man's changing attitude toward the negro. At first the colonists feared to educate the newly arrived Africans for fear that education would mean Christianization. That would have necessitated liberation, for the church forbade the enslavement of Christians. Then the prelates of the Church of England declared that Christians of African descent might be kept in servitude. Thereupon educational facilities slowly increased for a century and a half. By about 1830 a considerable number of schools for free negroes were in operation not only in the North but in the South. The next step was a strong reaction, especially in the South. Its cause was partly the invention of the cotton gin, the steam engine, and other forms of machinery which caused the demand for cotton to increase enormously. Cotton picking requires an abundance of the cheapest, least intelligent kind of labor. Educated negroes are of little use in cotton fields. The other cause of the setback of negro education was the growing abolition movement in the North, which aroused insurrections among the slaves and alarmed the slave holders. The owners of slaves feared that more education would increase the demand for freedom.

Mr. Woodson's book is geographical only as it indirectly illustrates the contrast in the attitude of the North and South. Even in the days when both sections believed in slavery, the climatic contrast caused them to view the negro problem in different lights.

ELLSWORTH HUNTINGTON.

ARNOLD, RALPH. **The Petroleum Resources of the United States.** *Econ. Geology*, Vol. 10, 1915, No. 8, pp. 695-712.

CAMERON, F. K. **Possible Sources of Potash in America.** *Journ. Franklin Inst.*, Vol. 180, 1915, No. 6, pp. 641-651. [Abstracted in the March *Review*, p. 217.]

CHURCH, J. E., JR. **Snow Surveying: Its Problems and Their Solution.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 607. [Author's abstract of paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. "The problem of precipitation and run-off has become the dominant meteorological problem in the semi-arid states where irrigation is fundamental to agriculture."]

—— **Climatological Data for the United States by Sections, December, 1915 (Vol. 2, No. 12).** Maps, diagrs. *U. S. Weather Bur.* [*Publ.*] *No. 571.*

FRANKENFIELD, H. C. **Sleet and Ice Storms in the United States.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 608. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

GEYER, O. R. **Coming Restoration of the Mississippi as an Important Artery of Commerce.** Ills. *Sci. Amer.*, Vol. 114, 1916, No. 9, pp. 215, 228, and 229.

HAZARD, D. L. **Distribution of the Magnetic Declination in the United States for January 1, 1915.** 16 pp. Map. *U. S. Coast and Geod. Surv. Special Publ. No. 33.* Washington, D. C., 1915. [See "A New Isogonic Chart of the United States" under Geographical Record in this number, p. 298.]

HUMPHREYS, W. J. **Earthquakes Felt in the United States During 1915.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 634-635.

KULLMER, C. J. **Monthly Storm Frequency in the United States.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 610. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. "The present

investigation covers the 30-year period 1883-1912 and furnishes a 30-year map of the distribution of storms for each month and also three 10-year maps for each month covering the same period.'']

LANE, F. K. **Economic Preparedness: Our Natural Resources and How They Are Being Developed.** *Sci. Amer.*, Vol. 114, 1916, March 4, pp. 237 and 258.

LUSCHAN, FELIX VON. **Die Neger in den Vereinigten Staaten.** *Kolon. Rundschau*, 1915, No. 11-12, pp. 504-540. Berlin.

MATTOON, W. R. **Shortleaf Pine: Its Economic Importance and Forest Management.** 66 pp. Map, diagrs., ills. *U. S. Dept. of Agric. Bull. No. 308.* Washington, D. C., 1915. [A text-map shows the geographical and commercial distribution of the shortleaf pine in the United States.]

MCSWEENEY, E. F., J. A. CONBY, AND LOMBARD WILLIAMS. **Analysis of the Present Foreign Trade of the United States.** 19 pp. *Directors of the Port of Boston Bull. No. 5.* Boston, 1916. [Claims that less than one-third of the $1,000,000,000 trade balance of the United States for the year ending June 30, 1915, represents permanent trade, i. e. a smaller figure than those for the previous four years.]

NORTHROP, J. D. **Petroleum in 1914.** pp. v and 893-1098. *Mineral Resources of the U. S., 1914*, Part II. U. S. Geol. Survey, Washington, D. C., 1916.

—— **Shipping Industry, Fortunes of the.** *The Nation*, No. 2645, Vol. 102, 1916, pp. 294 295.

SMITH, J. R. **Farming Appalachia.** Ills. *Amer. Review of Reviews*, Vol. 53, 1916, No. 3, pp. 329-336. [A plea for national mountain farming—for the cultivation of such important tree crops as the mulberry, pecan, and chestnut, accompanied with raising of hogs. Present farming in Appalachia is contrasted with conditions in Corsica, where the chestnut and goat play so important a part in the farm economy.]

STERRETT, W. D. **The Ashes: Their Characteristics and Management.** 88 pp. Maps, diagrs., ills. *U. S. Dept. of Agric. Bull. No. 299.* Washington, 1915. [Accompanied by a map of the United States east of the 100th meridian, 1:7,400,000, showing the commercial distribution of the ash tree as indicated by Census returns of lumber cut by counties in 1910.]

—— **Thunderstorms in the United States, 1904-1913, Percentage Frequency of.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 619-620.

WARD, R. DEC. **The Thunderstorms of the United States as Climatic Phenomena.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 612. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916. See also the note under Geographical Record in this number on the ''Distribution of Thunderstorms in the United States,'' p. 297.]

—— **War-Time Commerce, Historic Results of.** *The Nation*, No. 2643, Vol. 102, 1916, pp. 233-234. [An interesting feature of the United States trade of 1915 is the rise in value of ''foreign merchandise reëxported.'' It exceeds for the first time since 1806 the figures of the Napoleonic maximum, when neutral American shipping commanded the West Indian export trade.]

South Atlantic States

—— **Baltimore, Consular District of (Comprising the States of Maryland, Virginia, and West Virginia), Trade of the, Report for the Year 1914 on the.** 48 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5543. London, 1915.

—— **Hydro-Electric Systems, Interconnected, in the South.** Map. *Bull. Atlantic Deeper Waterways Assoc.*, Vol. 8, 1916, No. 3, pp. 17-18.

PRATT, J. H., AND H. M. BERRY. **Proceedings of Seventh Annual Drainage Convention of the North Carolina Drainage Association Held at Wilson, North Carolina, Nov. 18 and 19, 1914.** 76 pp. Diagrs., bibliogr. *North Carolina Geol. and Econ. Surv. Econ. Pap. 41.* Raleigh, 1915. [Includes papers on principles of drainage and drainage legislation in North Carolina.]

ROSS, F. E. **Latitude Observations with Photographic Zenith Tube at Gaithersburg, Md.** Diagrs., ills. *U. S. Coast and Geod. Surv. Special Publ. No. 27.* Washington, D. C., 1915.

—— **Savannah, Consular District of, Trade of the, Report for the Year 1914 on the.** 41 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5548. London, 1916. [While the cotton trade in general suffered heavily, the product known as ''linters''—the fiber removed in the final ginning of the seed—acquired a new importance from its use in the manufacture of explosives; export and price increased concomitantly.]

North-Central States

—— **Homeseeker, A Personal Word with the.** 72 pp. Map, ills. *Wisconsin Dept. of Agric. Bull. No. 2.* Madison, 1916. [General summary of Wisconsin's resources, with emphasis on agriculture, to attract intending settlers.]

HORE, R. E., W. E. HOPPER, AND R. A. SMITH. **Mineral Resources of Michigan, with Statistical Tables of Production and Value of Mineral Products for 1914 and Prior Years.** 359 pp. Maps, diagrs., ills. *Michigan Geol. and Biol. Surv. Publ. 19: Geol. Series 16.* Lansing, 1915.

SMITH, J. W., AND C. A. PATTON. **Ohio Weather for 1914.** pp. 293-372. Maps. *Ohio Agri. Exper. Sta. Bull. 287.* Wooster, Ohio, 1915. [The usual summary of records has been supplemented with a series of diagrammatic maps.]

—— **St. Paul, City of, Annual Report of the Commissioner of Public Works of the, for the Year Ending December 31, 1914.** 172 pp. Maps, diagr., index. [Material for city geography in the set of five maps, 1:27,600, showing extent of graded, paved, and sprinkled streets, parkways, sewers, and the type of railroad crossings, and in the set of three maps, 1:63,360, showing ward boundaries, territorial growth, and land owned by railroad companies.]

Original forest and prairie area in Illinois. 1:3,500,000 approx. Accompanies "An Ecological Study of Prairie and Forest Invertebrates," by Charles C. Adams, *Bull. Illinois State Lab. of Nat. Hist.*, Vol. 11, Art. 2. Urbana, 1915. [The paper was reviewed in the February *Review*, pp. 166-167.]

Western States

DARTON, N. H., AND OTHERS. **Guidebook of the Western United States. Part C: The Santa Fe Route, with a Side Trip to the Grand Canyon of the Colorado.** iv and 194 pp. Maps, ills. *U. S. Geol. Surv. Bull. 615.* Washington, 1915. $1.

This is the second of the U. S. Geological Survey's four transcontinental guides, two of which have already been reviewed (Northern Pacific route, Feb. *Review*, p. 153; Overland route, *Bull. Amer. Geogr. Soc.*, Sept., 1915, pp. 697-698.) Twenty-four maps on the scale of 1:500,000 represent continuous topography from Kansas City to Los Angeles. At least, it would be continuous topography did not the over-printing of geology in red on them greatly mar their legibility, which is a pity, indeed. The book is designed for the general traveler, who cannot be assumed to read topographic maps. But he *is* an intelligent person in this country and would quickly learn if given a fair chance. For the most part he will think he is given too much geology. All that helps to an understanding of topography, resources, or history, is good, and most of Darton's geology stands that test. Perhaps the animals of the remote past might have been spared. The text narrates the history of much of the exploration, settlement, and development of the region. It is concise, pointed, and well selected with regard to landmarks along the route. The book will make a trip over the Santa Fe more interesting than ever. The twenty-four maps alone, if freed of their red overprint, would be worth half the price of the volume. MARK JEFFERSON.

ALLEN, G. F. **Forest Types in the Rainier National Park.** Ills. *The Mountaineer*, Vol. 8, 1915, Dec., pp. 53-60. Seattle.

ALTER, J. C. **Weather Bureau Exhibit at San Francisco, 1915.** Ills. *Monthly Weather Rev.*, Vol. 43, 1915, No. 9, pp. 452-454.

BAKER, C. C. **Mexican Land Grants in California.** *Ann. Publs. Hist. Soc. of So. California*, Vol. 9, Part 3, pp. 236-243. Los Angeles, 1914. [See note with same title in the March *Review*, p. 219.]

BAKER, C. C. **The Rise and Fall of the City of Gladstone.** *Ann. Publs. Hist. Soc. of So. California.* Vol. 9, Part 3, pp. 188-194. Los Angeles, 1914. [See note with same title under "Geographical Record" in this number, p. 297.]

BEAL, C. H. **The Earthquake in the Imperial Valley, California, June 22, 1915.** Maps, ills. *Bull. Seismolog. Soc. of Amer.*, Vol. 5, 1915, No. 3, pp. 130-149. [Abstracted in the Feb. *Review*, pp. 142-143.]

CLELAND, R. G. **The First Expedition of Jedidiah S. Smith to California.** *Ann. Publs. Hist. Soc. of So. California*, Vol. 9, Part 3, pp. 200-203. Los Angeles, 1914.

COLE, MRS. CORNELIUS. **To California via Panama in 1852.** *Ann. Publs. Hist. Soc. of So. California*, Vol. 9, Part 3, pp. 163-172. Los Angeles, 1914.

DANIELS, MARK. **The Sequoia National Park.** Ills. *Amer. Forestry*, No. 265, Vol. 22, 1916, pp. 12-21. [Excellent photographs.]

DAVIS, E. F. **The Earthquakes of October 7, 1915, in Central California.** Map, diagrs. *Bull. Seismolog. Soc. of America*, Vol. 5, 1915, No. 4, pp. 230-235.

DILLER, J. S. **Mount Shasta: Some of Its Geologic Aspects.** Maps, ills. *Mazama*, Vol. 4, 1915, No. 4, pp. 11-16. Portland, Ore.

HARDESTY, W. P. **Physical Geography of Mount Shasta Region.** Ills. *Mazama*, Vol. 4, 1915, No. 4, pp. 17-18. Portland, Ore.

HOUSTON, D. F. **The National Forests.** Ills. *Amer. Forestry*, No. 267, Vol. 22, 1916, pp. 153-157.

JONES, J. C. **The Pleasant Valley, Nevada, Earthquake of October 2, 1915.** Maps, diagr., ills. *Bull. Seismolog. Soc. of America*, Vol. 5, 1915, No. 4, pp. 190-205.

MATTHES, F. E. **The Survey of Mount Rainier.** Diagrs., ills. *The Mountaineer*, Vol. 8, 1915, Dec., pp. 61-66. Seattle.

MCKEE, R. H. **The Glaciers of Mount Rainier in Comparison With Other Well-Known Systems of Glaciers.** Ills., bibliogr. *The Mountaineer*, Vol. 8, 1915, Dec., pp. 73-74. Seattle.

MONNET, PAUL. **Le Grand Désert americain.** *La Géogr.*, Vol. 30, 1914-15, No. 5, pp. 408-411. Paris. [The author infelicitously revives the long-since discarded term of "Great American Desert" to designate the arid and semi-arid regions of the Cordillera.]

—— **Mount Rainier National Park Number.** 118 pp. Map, diagrs., ills. *The Mountaineer*, Vol. 8, 1915, Dec. Seattle. [Individual articles of geographic interest listed above.]

—— **Portland, Oregon, Consular District of (Comprising the States of Oregon, Washington, Idaho and Montana, and the Territory of Alaska), Trade of the, Report for the Year 1914 on the.** 80 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5540. London, 1915.

SAUNDERS, E. J. **The Geological Story of Mount Rainier.** Diagr., ills. *The Mountaineer*, Vol. 8, 1915, Dec., pp. 67-72. Seattle.

WILCOX, W. F. **San Miguel River Canyon Flume—A Monument of Gold Mining Failure.** Ills. *Sci. Amer.*, Vol. 114, 1916, Jan. 29, No. 5, p. 123. [In western Colorado, near the Utah line.]

WOOD, H. O. **On a Possible Causal Mechanism for Heave-Fault Slipping in the California Coast Range Region.** Diagrs. *Bull. Seismolog. Soc. of America*, Vol. 5, 1915, No. 4, 214-229.

Panoramic view of the Rocky Mountain National Park, Colorado. 1:125,000. Department of the Interior, [Washington], [1915?].

Panoramic view of the Mesa Verde National Park, Colorado. 1:45,000. Department of the Interior, [Washington], [1915].

MEXICO AND CENTRAL AMERICA

BASCHIN, O. **Schweizerische Expedition nach der Mexikanischen Halbinsel Niederkalifornien.** *Die Naturwissenschaften*, Vol. 4, 1915, No. 53, pp. 723-724. [Abstract of a lecture by Arnold Heim on Lower California before the Berlin Geographical Society on Dec. 4, 1915.]

FLORES, T. **El mercurio en Mexico.** *Bol. Minero*, Vol. 1, 1916, No. 1, pp. 13-14. Depart. de Minas, Direcc. de Minas y Petroleo, Secr. de Fomento, Colon. e Industr., Mexico.

FRANK, J. C. **American Interoceanic Canals: A List of Works in the New York Public Library.** *Bull. New York Public Library*, Vol. 20, 1916, No. 1, pp. 11-81.

HAM, C. D. **Americanizing Nicaragua.** Map, ills. *Amer. Review of Reviews*, Vol. 53, 1916, No. 2, pp. 185-191.

HUEBNER, G. G. **Economic Aspects of the Panama Canal.** *Amer. Econ. Rev.*, Vol. 5, 1915, No. 4, pp. 816-829.

LANDA, LUIS. **Present Condition of Meteorology and Seismology in Honduras.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 610. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

ORDÓÑEZ, E. **Las principales unidades geográficas mexicanas y la distribución de los criaderos minerales.** *Bol. Minero*, Vol. 1, 1916, No. 2, pp. 55-57. Depart. de

Minas, Direcc. de Minas y Petroleo, Secr. de Fomento, Colon. e Industr., Mexico. [A general statement of the geographical provinces of Mexico preliminary to a discussion, to be subsequently published, of the regional distribution of the mineral deposits. The author urges the restriction of the term "Mesa Central" to the southern portion of the Mexican plateau, which he would divide into two parts: (1) the "Mesa Central," or Plateau of Anahuac, and (2) the "Gran Cuenca Mexicana," or the Great Basin region of northern Mexico, characterized by bolsons, interior drainage, and aridity.]

—— **Panama, L'obstruction du canal de.** Ills. *La Nature*, No. 2207, 1916, Jan. 15, pp. 47-48.

SLOSSON, E. E. **Lower California: Why We Need It and It Needs Us.** Map. *The Independent*, No. 3506, Vol. 85, 1916, pp. 227-228.

—— **Yucatan, Estado de, Boletín mensual de la Sección Meteorológica del: Año meteorológico de 1915 á 1916, mes de Julio de 1915,** pp. 755-794; **mes de Agosto de 1915,** pp. 795-836. Merida de Yucatan, Mexico, 1915.

SOUTH AMERICA

GENERAL

BOWMAN, ISAIAH. **South America: A Geography Reader.** xxii and 354 pp. Maps, ills., index. Rand, McNally & Co., Chicago, 1915. 75 cents. 7 x 5.

There is no mistaking the keynote of this little book as *human*. Throughout it admirably exemplifies the relations between man and nature. The reviewer does not know whether the school children it was written for will like it, but it is just what he wants for one of his classes, as it really pictures South American life. The material is excellently chosen and well illustrated: characteristic aspects of life and not merely strange ones are described, and the pictures belong to the argument instead of hailing from the office scrapbook. The best ones, of course, are the author's own, and the best part of the book is that which deals with the arid west he has known in person. The author oddly begins at the southern tip of the continent and works northward to Patagonia. To the reviewer's taste the Argentine Republic is undertreated. In culture and commerce it now leads the continent by a lead that is absolute, regardless of size or population, and 36 pages are not adequate—10 per cent of the volume. From the viewpoint of geographic interest the author is perhaps justified.

The maps, with the exception of an original vegetation map of the continent, are publisher-made. That facing page 202, where the Xingú River is the topic, has the river, but without the name on it. Peons are not so wholly badly off as represented, and has not Denis told us that the rubber gatherers were mainly not Indians but Ceará men?

MARK JEFFERSON.

—— **Latin America in 1915: A Review of the Financial, Commercial, Political, and Economic Progress of the Latin-American Republics of Argentina, Brazil, Chile, Uruguay, Mexico, Peru, etc., in 1915.** *South American Journ.*, Vol. 80, 1916, No. 2, pp. 23-54, *passim*. London.

—— **Lima–Buenos Ayres by Rail.** *South American Journ.*, Vol. 70, 1916, No. 3, p. 66. [This topic was discussed in the Jan. *Review*, p. 53.]

WAGNER, E. R. **De Santiago del Estero à Rio de Janeiro par le Gran Chaco, le haut Parana, et les colonies allemandes: L'expansion allemande et l'avenir français dans l'Amérique du sud.** Map. *La Géogr.*, Vol. 30, 1914-15, No. 5, pp. 394-404. Paris. [Abstract of a lecture before the Paris Geographical Society on June 11, 1915. The lecture was to be published in full in *La Revue*.]

Traders' map of South America, compiled from official maps of the several South American republics and other authoritative sources of information. 1:5,400,000. General Drafting Co., New York, 1915.

ECUADOR, PERU, BOLIVIA

HANN, J[ULIUS] VON. **Temperaturverhältnisse von Quito.** Diagrs. *Meteorol. Zeitschr.*, Vol. 32, 1915, No. 2, pp. 488-500.

—— **La Quiaca-Tupiza: Rival to Panama Canal.** Map, ills. *Bull. Pan American Union*, Vol. 41, 1915-16, No. 6, pp. 820-835. [Work has been commenced on this projected line of about 60 miles that will link up the east and west railroad systems of South America via Bolivia.]

LURQUIN, CONSTANT. **Contribución geográfica al progreso de Bolivia: Servicio oficial de la hora en la República; su utilidad prática i su significación científica.** *Bol. Soc. Geogr. Sucre*, No. 179-181, Vol. 16, 1915, pp. 141-164. [A discussion of the projected adoption of Greenwich time as the standard for Bolivia.]

LURQUIN, CONSTANT. **Bolivian Meteorology.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 610. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

NORDENSKIÖLD, ERLAND. **Die religiösen Vorstellungen der Itonama-Indianer in Bolivia.** *Zeitschr. für Ethnol.*, Vol. 47, 1915, No. 2-3, pp. 105-113. Berlin.

Mapa del Perú por la Sociedad Geográfica de Lima, dibujado por Camilo Vallejos Z, cartógrafo de la Sociedad. 1:1,500,000. Editado por la Libreria é Imprenta Gil, Lima, 1912.

BRAZIL

BELTRAN Y ROZPIDE, RICARDO. **El Río de los Aripuanas (Roosevelt, Teodoro, Castaña ó de la Duda).** *Rev. de Geogr. Colon. y Mercantil*, Vol. 12, 1915, No. 11-12, pp. 454-458. Real Soc. Geogr., Madrid. [This and the article in the same tenor by Captain Vasconcellos previously listed in the *Bull. Amer. Geogr. Soc.* for Nov., 1915 (p. 896), belittle Colonel Roosevelt's Brazilian expedition on the ground that the river explored was known to the Portuguese cartographers of the eighteenth century. However, their knowledge was restricted to its mouth—from which they naturally inferred the *existence* of a river—but this, no less than the fact that the rubber gatherers knew its lower course, does not invalidate the claim that the Roosevelt-Rondon expedition was the first to explore and instrumentally survey its whole course.]

DA CUNHA, A. P. **Determinação de coordenadas geographicas no estado do Ceará.** xviii and 171 pp. Map, diagrs., index. *Inspectoria de Obras contra as Seccas Publ. No. 27.* Rio de Janeiro, 1914.

MATTOS, J. N. B. **Dados climatologicos do anno de 1911.** 30 pp. Maps. *Serviço Meteorol. do Estado de São Paulo Bols. Nos. 21-24, Ser. II.*

MILLER, B. LER., AND J. T. SINGEWALD, JR. **The World's Deepest Mine.** Diagrs., ills. *Bull. Pan American Union*, Vol. 41, 1915-16, No. 6, pp. 805-819. [Morro Velho, in the gold belt of Brazil.]

Esboço do carta pluviometrica da região semi arida do Brasil, por H. E. Williams e Roderic Crandall. 1:3,000,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1910.

Mappa parcial do estado da Bahia, pelo engenheiro Roberto Miller. 1:500,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1913.

Mappa dos estados do Ceará, Rio Grande do Norte e Parahyba, com parte dos estados limitrophes pelo . . . H. E. Williams e Roderic Crandall. 1:1,000,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1910.

Mappa do estado da Parahyba. 1:500,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1913.

Mappa de parte dos estados de Pernambuco, Piauhy e Bahia, [pelo] engenheiro Roberto Miller. 1:500,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1913.

Mappa parcial do estado do Piauhy, pelo engenheiro H. L. Small. 1:1,000,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1914.

Mappa geologico da parte norte e central do estado do Piauhy e adjacencias, pelo engenheiro Horatio L. Small. 1:1,000,000. Accompanies "Geologia e supprimento d'agua subterranea no Piauhy e parte do Ceará," by H. L. Small, *Inspectoria de Obras contra as Seccas Publ. No. 32.* Rio de Janeiro, 1914. [The text was listed in the February *Review*, p. 154.]

Mappa do estado de Sergipe e da parte nordeste do estado da Bahia, pelo engenheiro R. H. Sopper. 1:1,000,000. Inspectoria de Obras contra as Seccas, Minist. da Viação e Obras Publicas, [Rio de Janeiro], 1914.

Mappa geologico do estado de Sergipe e da parte nordeste do estado da Bahia, pelo engenheiro R. H. Sopper. 1:1,000,000. Accompanies "Geologia e supprimento d'agua subterranea em Sergipe e no nordéste da Bahia," by R. H. Sopper, *Inspectoria de Obras contra as Seccas Publ. No. 34.* Rio de Janeiro, 1914. [The text was listed in the February *Review*, p. 154.]

EUROPE

British Isles

Innes, A. D. **A History of England and the British Empire. Vol. 1: Before the English Came, to 1845.** xxxiii and 539 pp. **Vol. 2: 1485-1688.** xxxi and 553 pp. **Vol. 3: 1689-1802.** xxvi and 550 pp. **Vol. 4: 1802-1914.** xxxv and 604 pp. Maps and index in each. The Macmillan Co., New York, 1913, 1914, 1915. $1.60 each. 8 x 5½.

The amount of space assigned to the work required a high power of condensation, and in this the writer excels, giving in general quite clear descriptions of intricate matters in the fewest possible words. The work is largely taken up with the dynastic politics and wars of the country. The accounts of these matters are remarkably well done, and from the short and plain descriptions of military strategy and battle tactics on sea and land, the general reader, with the help of the well-drawn battle plans, may easily form a good idea of the military and naval movements. At the close of each volume there are well-written chapters on the manners and customs of the period dealt with, the time-spirit, and the growth of its political, economic, social, educational, financial, and commercial institutions. The geographical factor in the historical product is recognized and somewhat developed, in differentiating the medieval from the modern period; but it might have been shown with advantage, the British Empire being an island empire, that islands in general are relatively restricted in area and that hence an island-dwelling nation, as it expands and increases, finally is unable to derive from its native habitat sufficient food to support its population and so is forced to draw food supplies from without and, to safeguard these in time of war, is obliged to have food-producing colonies and a merchant marine to carry its food supplies and a strong navy to protect them from the depredations of enemies. Consequently the geographical factor is an all-important element in the evolution of the British Empire. David H. Buel.

Moss, C. E. **Vegetation of the Peak District.** x and 235 pp. Maps, ills., index. University Press, Cambridge (G. P. Putnam's Sons, New York), 1913.

The survey of the vegetation of Great Britain which is being carried on by members of the British Ecological Society has received a notable contribution in Doctor Moss's volume. The region which he has studied embraces the southern Pennine uplands, covering portions of four counties in one of the most elevated parts of England. The plant associations of this region are described in great fullness, their relation to each other is demonstrated, and the influence of underlying rock in determining their character is particularly well worked out. The woodland, scrub, grassland, and moor of today represent almost entirely areas which were formerly forested. The types of woodland and grassland are quite distinct on siliceous and on calcareous soils, oak and nardus being predominant on the former and ash and fescue grass on the latter. Two detailed maps show the distribution of the plant associations and also the extent of cultivation of wheat and oats; many exceptionally fine illustrations portray typical plant communities. This well-digested and carefully presented work constitutes one of the best pieces of recent European vegetational investigation. Forrest Shreve.

Fleming, Rufus. **Scotland.** 11 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 190. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Holst, N. O. **The Ice Age in England.** *Geol. Magazine*, Sixth Decade, Vol. 2, 1915, No. 9, pp. 418-424; No. 10, pp. 434-444; No. 11, pp. 504-513.

—— **Rainfall in 1915, British.** *Nature*, No. 2412, Vol. 96, 1916, Jan. 20, p. 576.

Shaw, W. N. **Organization of the Meteorological Office in London.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 9, pp. 449-452. [Reprinted from the "Tenth Annual Report of the Meteorological Committee for the Year Ended 31 March, 1915," pp. 65-74.]

Distribution of vegetation in the Peak District, by C. E. Moss. 1:63,360. Accompanies "Vegetation of the Peak District," by C. E. Moss, Cambridge University Press, Cambridge, 1913. [Book reviewed above.]

Philips' Comparative Series of Wall Atlases: British Isles, edited by J. F. Unstead and E. G. R. Taylor, with explanatory handbook for teachers. 8 maps: 1, relief of land; 2, political; 3 and 4, climate; 5, geological; 6, agriculture and fishing; 7, industrial; 8, density of population. [Maps 2, 3, 4, 5, 6, and 8 in 1:1,000,000, 1 in 1:1,500,000, and 7 in 1:750,000.] George Philip & Son, Ltd., London, 1914. [The excellence of this series, which systematically represents all phases of the geography of a region, has been dwelt

upon before (*Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, p. 640). The larger scale of the present set, as compared with the continental maps constituting the remainder of the series, permits of a more intimate treatment.]

Thames valley rainfall, November, 1915. 1:1,267,200. Accompanies, opp. p. 183, *Symons's Meteorol. Mag.*, No. 599, Vol. 50, December, 1915.

Scandinavia, including Finland

Key, Helmer. **La vie économique de la Suède.** 166 pp. Plon-Nourrit et Cie, Paris, 1913. 10 x 6½.

The author presents a carefully digested summation of the social and industrial statistics of Sweden for the first decade of the century and from this base produces a shrewd analysis of the economic situation and forecast of its movement upward in progress. In this we note an omission common to most such treatises on the wealth of any nation, the index of national prosperity exhibited by the movement of population. No state can be said to strike an even or a favorable balance of the common weal when the balance is reached by means of the loss of any considerable mass of its producing population. Some reference should have been made to the considerable loss of Sweden's excellent citizenship which would be under no impulse to come to this country if conditions at home gave promise of prosperity to the individual of ambition.

William Churchill.

Reade, Arthur. **Finland and the Finns.** xi and 315 pp. Map, ills., index. Dodd, Mead & Co., New York, 1915. $3.00. 9 x 6.

An excellent handbook on Finland, by an English resident (lecturer in English at the University of Helsingfors). The introductory chapter deals with the history, geology, geography, ethnology, and language of Finland. Then follow descriptions of the national movement, the racial struggle, life in town and country, manners, customs, and beliefs. A good idea is given of the Finnish epic Kalevala (Hero-land), with an extended account of Finnish literature, and music. Other topics discussed are education, politics, industry, the labor movement, female suffrage, the position of Finland in the Russian Empire and the process of making Finland a province of Russia. David H. Buel.

—— **Finland, Befolkningsrörelsen i, åren 1911 och 1912: Befolkningsstatistik.** 209 pp. *Bidrag till Finlands Officiella Statistik No. 46.* Helsingfors, 1915. [Vital statistics of the population. Captions in Swedish and French.]

—— **Finland, Statistisk Årsbok för, Ny Serie, Tolfte Årgången, 1914.** xxviii and 649 pp. Map. Utgifven af Statistiska Centralbyrån, Helsingfors, 1915. 9½ x 7. [Statistical matter giving revision of 1910 census figures. Data relating to population, agriculture, and colonization are important.]

—— **Finlands folkmängd den 31 December 1910 (enligt församlingarnas kyrkoböcker): Befolkningsstatistik. Vol. 1: Folkmängden samt befolkningens fördelning efter kön, ålder, civilstånd, sprak, trosbekännelse, bildningsgrad och födelseort äfvensom den franvarande befolkningens fördelning efter vistelseort.** 321 pp. *Bidrag till Finlands Officiella Statistik No. 45.* Helsingfors, 1915. [Census of Finland for 1910. Size of population and distribution according to sex, age, occupation, language, creed, education, origin, etc.]

Flodström, I. **Till fragan om rasskillnader inom Sveriges befolkning.** Map. *Ymer*, Vol. 35, 1915, No. 3, pp. 213-266. [Racial composition of the population of Sweden.]

Foght, H. W. **Rural Denmark and Its Schools.** xi and 355 pp. Map, diagrs., ills., index, bibliogr. The Macmillan Co., New York, 1915. $1.40. 7½ x 5.

Gaarder, Torbjørn. **Surstoffet i fjordene (De vestlandske fjordes hydrografi, I).** 200 pp. Diagrs., ill., bibliogr. *Bergens Museums Aarbok, 1915-1916: Naturvidensk. Række*, No. 1, Art. 2. [The oxygen content of the waters of the Norwegian fiords and its bearing on marine life. Detailed examination of the fiords near Bergen.]

Guinchard, J., edit. **Sweden: Historical and Statistical Handbook.** [Issued] by order of the Swedish Government. 2nd edition, English issue. **Vol. 1: Land and People.** xxvi and 781 pp. **Vol. 2: Industries.** xi and 759 pp. Maps, ills., index. P. A. Norstedt & Söner, Stockholm, 1914. 9½ x 6½. [Excellent handbook of the economic and cultural life of Sweden. German edition reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 786-787.]

Harris, E. L. **Sweden.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 16c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Geographic location is responsible for Sweden's commercial importance during

the present war. Businesses prospering considerably include banking—much money has passed between Germany and Russia on account of prisoners of war—and shipping.]

—— **Hydrografiska byrån Årsbok 5 för år 1913.** 263 pp. Maps, diagrs. Stockholm, 1915. [Contains small maps of Sweden showing the following: rainfall, monthly and annual for 1913; accumulated snowfall on the first of each month from Oct. 1, 1912, to May 1, 1913; duration of snow-cover during that winter; date of freezing and opening of lakes in the autumn of 1912 and spring of 1913; duration of freezing temperature in days.]

—— **Järnvägar, Statens, av Kungl. Järnvägsstyrelsen: År 1914.** 236 pp. Maps, diagrs., ills. *Sverges Officiella Statistik*, Stockholm, 1915. [Accompanied by a map of southern Sweden, and one of the rest of the country, both 1:2,000,000, showing in color the ownership, gage, and stage of construction of its railroads.]

—— **Järnvägsstatistik, Allmän, av Kungl. Järnvägsstyrelsen: År 1913.** vii and 107 pp. Maps. *Sverges Officiella Statistik*, Stockholm, 1915. [Accompanied by similar maps to those of the 1914 edition, listed immediately above.]

KOLDERUP, C. F. **Jordskjælv i Norge i 1913.** 18 pp. Maps. *Bergens Museums Aarbok 1914-1915: Avhandlinger og Aarsberetning*, No. 3, Art. 16. [Earthquakes in Norway during 1913. Summary in German.]

KOLDERUP, C. F. **Jordskjælv i Norge i 1914.** 11 pp. Map. *Bergens Museums Aarbok 1914-1915: Avhandlinger og Aarsberetning*, No. 3, Art. 17. [Summary in German.]

—— **Norway, Trade and Commerce of, Report (Supplementary), for the Year 1913 on the.** 16 pp. *Diplomatic and Consular Reports*, Ann. Series, No. 5534. London, 1915.

OXAAL, JOHN. **Traenlandet.** Maps, diagrs., ills. *Norske Geogr. Selskaps Aarbok*, Vol. 25, 1913-1914, pp. 55-101. [A discussion of the effect of marine erosion and glaciation on the rock structure of an archipelago off the Norwegian coast at the Arctic Circle. A colored map, 1:400,000, showing the hypsometry and bathymetry of the Norwegian coast between 67° and 66° N. accompanies the paper.]

RABOT, CHARLES. **Le guerre et l'élevage du renne en Laponie.** Ills. *La Nature*, No. 2207, 1916, Jan. 15, pp. 39-42.

Topografisk kort over kongeriket Norge. 1:100,000. Sheets: 9C, Skien; 15C, Fet; 26A, Hamar. Norges Geografiske Opmaaling, [Christiania], 1914.

Landgeneralkart over Norge. 1:250,000. Blad LV, Kristiania. Norges Geografiske Opmaaling, [Christiania], 1915.

AUSTRIA-HUNGARY

AMPFERER, OTTO. **Verteidigung des interglazialen Alters der Höttinger Breccie.** *Petermanns Mitt.*, Vol. 61, 1915, Sept., pp. 336-338. [The age of the Höttinger breccia, which caps a limestone range north of Innsbruck, is a matter of controversy among German geologists.]

BASCHIN, O. **Die österreichisch-ungarischen Küstenländer.** *Die Naturwissenschaften*, Vol. 3, 1915, No. 45, pp. 611-612. [Summary of a lecture by N. Krebs before the Berlin Geogr. Society, Oct. 9, 1915.]

GIGANTE, SILVINO. **A Velenceiek Fiuméban.** *A Tenger*, Vol. 5, 1915, No. 11-12, pp. 349-359. Hungarian Adriatic Assoc., Budapest. [On the Venetians in Fiume.]

PFAUNDLER, R. v. **Österreichisch-italienische Grenzfragen.** Map. *Petermanns Mitt.*, Vol. 61, 1915, June, pp. 217-223. [The map accompanying this article is omitted from the copies of the journal sent outside of Germany, says a publisher's statement, and will be supplied after the war.]

PFAUNDLER, R. v. **Österreichisch-italienische Grenzfragen: [Nachtrag auf Grund des neuen österreichischen Rotbuches].** Map. *Petermanns Mitt.*, Vol. 61, 1915, Sept., pp. 333-335. [The map accompanying the same author's article in the June number of *Petermanns Mitt.*, listed above, serves as an illustration for this one also.]

RAVANI, LUIGI. **Pelagosa.** Bibliogr. *La Geogr.*, Vol. 3, 1915, No. 7-10, pp. 313-319. Novara. [Pelagosa, in Austrian possession, is one of a bridge of islands between the Dalmatian and Italian coasts.]

WALLNER, JULIUS. **Beiträge zur Geschichte des Fischereiwesens in der Steiermark: Das Gebiet der Mur.** *Archiv für Fischereigeschichte*, 1915, April, No. 5, pp. 47-103; Oct., No. 6, pp. 55-156. Berlin.

Balkan States, including Rumania

Wace, A. J. B., and M. S. Thompson. **The Nomads of the Balkans: An Account of the Life and Customs Among the Vlachs of Northern Pindus.** x and 332 pp. Ills., index. E. P. Dutton & Co., New York, 1913. $5. 9 x 6.

This study has neither literary form, imagination, nor unique data to hold one to its reading. There is no reason why ethnic data should not be presented in an interesting manner. The authors spent the summers of 1910 and 1911 among the Vlachs, the nomads of the Balkans; so they did not lack knowledge, but they failed to present "human interest."

The Vlachs are scattered in limited bands over their native lands. They are pastoral rather than agricultural and spend their winters with their flocks and herds on the plains, returning to their mountain villages with the green pastures of spring. They extend in isolated areas from the Adriatic to the Aegean Sea. Near the Adriatic they are found from Durazzo in the north to Avlona in Albania in the south. They extend intermittently eastward over Greece, northward over southern Serbia, and still farther northeastward into Bulgaria. Undoubtedly Vlachs are today in arms in all those countries. Their young men have been migrating to the United States in considerable numbers since 1908.

The most interesting thing brought out by the authors is the origin and history of the Vlachs. The people call themselves "Aromuni," or Romans. Their language, both in vocabulary and structure, is undeveloped Latin. Now, who are the Vlachs—descendants of Roman colonists, or Romanized tribes of the Balkan area? As early as the sixth century A.D. Procopius recorded a list of fortified Balkan towns having Vlach names, though the language was not written until the eighteenth century. About 976 A.D. the Vlachs were again spoken of in written history; near the close of the twelfth century they came into prominence. In 1192 they routed the Byzantine army and nearly captured the Emperor. From 1196 until 1207 Johanizza was sole king of the Vlachs and the Bulgarians; the Greeks were his allies. Two neighboring Vlachian kingdoms flourished until the fourteenth century. Great Vlachia ceased to exist in 1308, and Little Vlachia was conquered by the Serbians in 1350. Since that date the scattered Vlachs have lived among the various dominating nations which have held their territory. They are only slowly being amalgamated and assimilated. It is believed that the Vlachs are mainly "the descendants of Romanized hill tribes rather than of actual Roman colonists, who would long since have been absorbed by the other town-dwelling races, and in particular the Greeks"—who everywhere in the Near East, where Roman and Greek have met, have absorbed the Roman. A. E. Jenks.

—— **Cyclades, Trade and Commerce of the, Report for the Year 1914 on the.** 21 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5537. London, 1915.

Tedeschi, E. C. **L'espansione economica italiana in Balcania.** *Riv. Coloniale*, Vol. 10, 1915, No. 6, pp. 305-315. Rome.

Weiss-Bartenstein, W. K. **Bulgariens Handelsbeziehungen zu seinen Nachbarstaaten.** *Weltwirtschaft*, Vol. 5, 1915, No. 9, pp. 184-187. Berlin.

Sketch map of the southern Balkans [showing] principal Vlach areas. 1:2,050,000. Accompanies, opp. p. 206, "The Nomads of the Balkans," by A. J. B. Wace and M. S. Thompson, E. P. Dutton & Co., New York, [1913]. [Book reviewed above.]

Spain, Portugal

Becerra, L. L. **Osma: Monografía geográfica.** *Bol. Real Soc. Geogr.*, Vol. 12, 1915, No. 10, pp. 377-400. Madrid. [Osma is an old Moorish town in north-central Spain in the province of Soria.]

Buen, Odón de. **El valle del Lozoya: Extracto de la monografía geólogica publicada por D. Lucas Fernández Navarro.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 12, 1915, No. 11-12, pp. 459-463. Real Soc. Geogr., Madrid.

Chico y Rello, Pedro. **Zamarramala: Monografía geográfica.** Map, ills., bibliogr. *Bol. Real Soc. Geogr.*, Vol. 12, 1915, No. 9, pp. 337-361. Madrid. [Zamarramala is a small town near Segovia.]

—— **Corunna, now Vigo, Consular District of (Comprising the Provinces of the Asturias, Leon, and Galicia), Trade and Industries of the, Report for the Year 1914 on the.** 42 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5563. London, 1916.

—— **Lisbon, Consular District of, Trade of the, Report for the Year 1914 on the.** 28 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5514. London, 1915.

—— **Oporto, Consular District of, Trade of the, Report for the Year 1914 on the.** Map. 17 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5536. London, 1915.

SPRAGUE, R. L. **Gibraltar.** 6 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 20a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Mapa Militar Itinerario de España, 1:200,000: Hojas 24, 39 and 94. Depósito de la Guerra, [Madrid], 1914 and 1915.

[Province of] Ávila. 1:425,000. Alberto Martin, Editor, Barcelona, [1915].

[Province of] Granada. 1:500,000. Alberto Martin, Editor, Barcelona, [1916].

[Province of] Lugo. 1:400,000. Alberto Martin, Editor, Barcelona, 1915.

[Province of] Madrid. 1:400,000. Alberto Martin, Editor, Barcelona, [1915].

[Province of] Santander. 1:350,000. Alberto Martin, Editor, Barcelona, [1915].

[Province of] Sevilla. 1:500,000. Alberto Martin, Editor, Barcelona, [1915].

Plano de Almeria, revisado por el Ayuntamiento y facilitado por D. Gabriel Pradal Ruiz. 1:7,500. Alberto Martin, Editor, Barcelona, [1916].

Plano de Málaga, revisado por el Ayuntamiento y corregido por Manuel Zafazár. 1:7,500. Alberto Martin, Editor, Barcelona, [1915].

Plano de Murcia, facilitado por D. Pedro Garcia Faria. Revisado por el Ayuntamiento. 1:5,000. Alberto Martin, Editor, Barcelona, [1915].

Plano de Pamplona, facilitado y revisado por el Ayuntamiento. 1:4,500. A. Martin, Editor, Barcelona, 1915.

AFRICA

ATLAS REGION

BLAKE, MAXWELL. **Morocco.** 5 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 75a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

CAMBON, VICTOR. **Les grands travaux au Maroc et l'Exposition de Casablanca.** Map, ills. *La Nature*, No. 2208, 1916, Jan. 22, pp. 49-53. [French development of Morocco since the war began.]

KEMP, E. C. **Tunis.** 4 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 79c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

ONTIVEROS, J. G. **El distrito consular de Mazagán: Reformas y modificaciones de que ha sido objecto desde 1912.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 12, 1915, No. 11-12, pp. 421-453. Real Soc. Geogr., Madrid. [Spanish consular report dealing with commercial reforms introduced by the French régime in Morocco.]

—— **Tangier, Consular District of, Trade of the, Report for the Year 1913 on the.** 56 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5559. London, 1916. [The prospective internationalization of Tangier improved trade by bringing thither an influx of money and Europeans, though fighting in the adjacent Spanish zone cut off much interior trade. Tangier was spared attack because—it is said—the most powerful hill tribe receive their supplies from it and declared it sacred.]

SUDAN AND UPPER GUINEA

AYMERICH, GÉNÉRAL. **La conquête du Cameroun.** *L'Afrique Française*, Vol. 25, 1915, No. 10-12, pp. 309-315. [Contains material of geographic interest.]

F., J. **La conquête du Cameroun septentrional.** Map, diagr., ills. *L'Afrique Française*, Vol. 25, 1915, No. 10-12, pp. 279-289. [Contains material of geographic interest.]

—— **Guinea, Spanish Possessions in the Gulf of, Trade of the, Report for the Year 1914 on the.** 9 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5519. London, 1915.

HUBERT, HENRY. **Les séismes en Afrique occidentale française.** Map. *La Géogr.*, Vol. 30, 1914-15, No. 5, pp. 359-364. Paris.

JOSEPH, GASTON. **Villes d'Afrique: Bondoukou.** *Renseign. Colon.* (*Suppl. à l'Afrique Franç.*), 1915, No. 10-12, pp. 202-206. [Bonduku lies in the French Ivory Coast near the boundary of the British Gold Coast colony.]

MARTIN, CAMILLE. **Togo et Cameroun: Formation et composition territoriales.** Maps. *Renseign. Colon.* (*Suppl. à l'Afrique Franç.*), 1915, No. 10-12, pp. 177-202. [Summary of the physical and economic geography.]

WESTERMANN, DIEDRICH. **Vier Monate in Liberia: Ein Besuch in Boporu und Medina.** *Kolon. Rundschau*, 1915, No. 11-12, pp. 559-565. Berlin.

EAST AFRICA

RAVA, MAURIZIO. **Al Lago Tsana (il mar profondo d'Etiopia): Relazione del viaggio compiuto dalla Missione Tancredi per incarico della Reale Società Geografica.** Con un'appendice di geografia agronomica del Cav. Giuseppe Ostini. viii and 270 pp. Maps, ills., index. Reale Società Geografica, Rome, 1913. Lire 5. 10 x 7.

A varied miscellany of travel is presented in this account of the Tancredi Mission to the heart of mountainous Abyssinia. The trip was undertaken under the auspices of the Royal Italian Geographical Society. Although this country has been the favorite tramping ground of Italian explorers in recent years, it was reserved for the author to accomplish the first circuit on land of the shore of Lake Tsana. A flowing narrative style takes the reader day by day along the successive stages of the journey. Two phases of observation appear to have attracted the author particularly. He dwells lengthily on the Abyssinians and their customs, as well as on the resources of their territory. Taken together, the pages of the book give a good idea of the belt of land extending immediately southwest of Eritrea to the sources of the Blue Nile. Its want of method, however, is the book's main defect. Systematic presentation might be expected, inasmuch as four years elapsed between the return of the expedition and the printing of the book.

An appendix by G. Ostini on the agricultural resources is an instructive summary of the economic conditions which prevail in the lowlands—once also lake-beds—surrounding the lake.

—— **Uganda: Report for 1914-15.** 23 pp. Map. *Ann. Colonial Repts., No. 873.* London, 1916.

ASIA

TURKEY IN ASIA, ARABIA, CAUCASIA, IRAN

WILD, L. H. **Geographic Influences in Old Testament Masterpieces.** xiii and 182 pp. Map, index. Ginn & Co., New York, 1915(?). $1.00. 7½ x 5½.

This attractive little volume is a good example of the way in which the modern geographical viewpoint is gradually leavening all branches of human thought. In teaching her Bible classes Miss Wild found that a knowledge of geographic influences in Palestine was essential. She was impressed by the fact that scores of the finest Biblical passages are in a large measure geographical descriptions. Therefore she read the best books on the geography of Palestine and then boiled them down to fit her classes.

The first chapter is a condensed but clear picture of the main features of the country, brightly written and easy to grasp, but characterized by enthusiasm rather than by scientific accuracy. Then follow a series of chapters on the coast, the roads, the hills, the attractions of the plain, Mount Carmel and the rains, the thunderstorm psalm, and similar subjects. The chapter entitled "Naaman's Scorn of the Jordan" illustrates Miss Wild's method. She brings out the simple artlessness of the story, the sharp contrast between the clear Abana and the muddy Jordan, the unusualness of such a visit as that paid by Naaman to Elisha. Then she lets the Bible tell its own story, but the reader sees the geographical setting much better because of what has gone before. Each chapter is provided with half a dozen references to some of the best and most easily accessible books by scholars who have known the country at first hand.

ELLSWORTH HUNTINGTON.

—— **Bahrein Islands, Trade of the, Report for the Year ending March 31, 1915, on the.** 26 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5555. London, 1916.

BAIKIE, JAMES. **The Cradle of Civilization: The Historic Lands Along the Euphrates and Tigris Rivers Where Briton Is Fighting Turk.** Ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 2, pp. 127-162.

BASCHIN, O. **Reisen im nördlichen Kleinasien.** *Die Naturwissenschaften*, Vol. 4, 1915, No. 50, pp. 670-672. [Abstract of a lecture by R. Leonhard before the Berlin Geographical Society, Nov. 6, 1915.]

CLAY, A. T. **Pushing Back History's Horizon: How the Pick and Shovel Are Revealing Civilizations That Were Ancient When Israel Was Young.** Map, ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 2, pp. 162-216. [Archeological research in Babylonia and Assyria; wealth of excellent photographs.]

CRUZET, V. **L'Arabie et le peuple arabe avant l'avènement du prophète Mohammed.** *Bull. de la Section Tunisienne, Soc. de Géogr. Comm. de Paris*, 1913-14, No. 4, pp. 122-166.

—— **Economische toestanden in het Turksche Rijk.** *Tijdschr. voor Econ. Geogr.*, Vol. 6, 1915, No. 11, pp. 444-452. The Hague.

GEERE, H. V. **Lower Mesopotamia.** *United Empire*, Vol. 7, N. S., 1916, No. 1, pp. 16-26.

INDELLI, PAOLO. **La Cilicia (il Vilayet di Adana).** 79 pp. *Direz. Gen. degli Affari Commerciali [Publ.] No. 13.* Minist. degli Affari Esteri, Rome, 1915.

M[ARTEL], E. A. **Alexandrette et le chemin de fer de Bagdad.** Map, ills. *La Nature*, No. 2206, 1916, Jan. 8, pp. 31-32.

MICHELL, R. L. N. **Cyprus To-day.** *United Empire*, Vol. 7, N. S., 1916, No. 1, pp. 60-75. [Development of the island is bound up with agricultural reform; in the first place, with progress in irrigation.]

—— **Seistan and Kain, Districts of, Trade of the, Report for the Year Ending March 20, 1914, on the.** 22 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5539. London, 1915.

[Five maps of Bible Lands]: 1, Composite map of Bible Lands and North America; 2, Physical and political map of Bible Lands; 3, History map of Bible Lands; 4, Palestine elevations; 5, Palestine towns. Each 8 x 12 in. Scribner's Sons, New York, 1915.

CHINA

—— **Chefoo, Trade of, Report for the Year 1914 on the.** 13 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5547. London, 1915.

—— **Hankow, Trade of, Report for the Year 1914 on the.** 12 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5551. London, 1916.

JAMESON, J. P. **The Newly Opened Commercial Port of Pukow.** *Commerce Repts.*, 1916, No. 13, pp. 218-219. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C., 1916. [Abstracted in the March *Review*, p. 221.]

KINNOSUKE, ADACHI. **China's Vast Resources: How Japan and America Can Co-operate to Aid in Chinese Development.** *Amer. Review of Reviews*, Vol. 53, 1916, No. 2, pp. 210-213.

LAUFER, BERTHOLD. **The Diamond: A Study in Chinese and Hellenistic Folk-Lore.** 75 pp., index. *Field Museum of Nat. Hist. Publ. 184 (Anthropol. Series*, Vol. 15, No. 1). Chicago, 1915. [A phase of the influence of Western civilization on the Far East in classical times.]

LEGENDRE, A. F. **Enquètes économiques en Chine: Les grands ports de la Chine; Le chemin de fer du Yunnan.** *Bull. Soc. de Géogr. Comm. de Paris*, Vol. 37, 1915, No. 10-12, pp. 273-283.

—— **Mengtzu, Trade of, Report for the Year 1914 on the.** 5 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5541. London, 1915.

SHERFESEE, W. F. **The Reforestation Movement in China.** Ills. *Amer. Forestry*, No. 263, Vol. 21, 1915, Nov., pp. 1033-1040. [See abstract in the Geographical Record in this number under "Reforestation in China," pp. 301-302.]

SIMPSON, T. H. **Restoring China's Forests: A New American Influence in the Empire.** Ills. *Amer. Review of Reviews*, Vol. 53, 1916, No. 3, pp. 337-340.

—— **Trade, Returns of, and Trade Reports, 1914. Part 2: Port Trade Statistics and Reports. Vol. 4: Southern Coast Ports (Santuao to Pakhoi).** pp. 885-1266. *China Maritime Customs, Statist. Series, Nos. 3 and 4.* Shanghai, 1915.

—— **Tsinan and Tsingtau, Trade of, Report for the Year 1914 on the.** 6 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5517. London, 1915. [The report is unstatistical, as no trade figures are available.]

—— **Wuchow, Trade of, Report for the Year 1914 on the.** 11 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5499. London, 1915.

Plan of Chinkiang Harbour. 1:24,000. Accompanies "Yangtze Ports," being Vol. 2 of Part 2, *Port Trade Statistics and Reports.* Statistical Dept. of Inspector General of Customs, Shanghai, 1915.

Farther India, including Burma

Bovo, Goffredo. **Il commercio del Siam, dal 1° aprile 1914 al 31 marzo 1915.** 9 pp. *Direz. Gen. degli Affari Commerciali* [*Publ.*] *No. 14.* Minist. degli Affari Esteri, Rome, 1915.

Briggs, L. P. **French Indo-China.** 7 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 54c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Dreier, C. L. **Straits Settlements.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1915, No. 56d. Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

Maurizio, Piscicelli. **Nel Cambodge.** Ills. *Boll. Reale Soc. Geogr.*, Vol. 4, 1915, No. 9, pp. 959-985. Rome.

Moorhead, M. K. **Burma.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 50a, pp. 18-24. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Saigon, Trade of, Report for the Year 1914 on the.** 18 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5538. London, 1915.

—— **Senggora [Siam], Consular District of, Trade and Commerce of the, Report for the Year April 1, 1913, to March 31, 1914, on the.** 13 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5447. London, 1915.

Commission de délimitation de la frontière entre l'Indo-Chine et le Siam, 1907-8. 5 secteurs. 1:200,000. Service Géographique de l'Indo-Chine, [Hanoi], 1907-9.

Commission de délimitation entre l'Indo-Chine et le Siam. Sheets: Bassac, Dangrek, Grand Lac, Haute Mé-Nam, Khong, Mg. Khop-Mg. Xieng Lom, Mg. Krat, Mg. Nan, Nam Heung, Pak-Lay, Phnom Coulen. 1:200,000. H. Barrère, Editeur-Géographe, Paris, [1907?].

AUSTRALASIA AND OCEANIA

Melanesia, Micronesia, Polynesia

Daly, R. A. **Problems of the Pacific Islands.** Maps, diagrs., ills. *Amer. Journ. of Sci.*, Vol. 41, 1916, Feb., pp. 153-186. [Abstracted in this number on p. 303.]

Jaggar, T. A., Jr. **Activity of Mauna Loa, Hawaii, December-January, 1914-15.** Map, diagrs., ills. *Amer. Journ. of Science*, Vol. 40, 1915, Dec., pp. 621-639. [See abstract in the March *Review*, pp. 222-223.]

MacCurdy, G. G. **Race in the Pacific Area, with Special Reference to the Origin of the American Indians: Antiquity of Occupation.** *Amer. Anthropologist*, Vol. 17, 1915, No. 4, pp. 708-711.

Mayer, A. G. **The Islands of the Mid-Pacific.** Map, diagrs., ills. *The Scientific Monthly*, Vol. 2, 1916, No. 2, pp. 125-148. [Abstracted in this number, pp. 303-304.]

—— **New Caledonia, Trade, etc., of, Report for the Year 1914 on the.** 14 pp. Map. *Diplomatic and Consular Repts.*, Ann. Series, No. 5533. London, 1915.

—— **Society Islands, Trade and Commerce of the, Report for the Year 1914 on the.** 12 pp. *Diplomatic and Consular Repts.*, Ann. Series, No. 5552. London, 1916. [The war is responsible for a degree of improvement in the cultivation of Tahiti. Many Chinese traders arriving there and finding no opening for their usual business offered themselves as laborers or started small plantations on their own account.]

POLAR

Antarctic

Mossman, R. C. **On a See-Saw of Barometric Pressure, Temperature, and Wind Velocity between the Weddell Sea and the Ross Sea.** Map. *Proc. Royal Soc. Edinburgh*, Vol. 35, 1914-1915, Part 2, pp. 203-216.

The author is an authority on Antarctic meteorology. He has lately been devoting himself especially to a study of the correlations which exist between seasonal meteorological conditions in different parts of the world, with particular reference to the Antarctic area. That the whole atmospheric system, of the so-called "permanent" areas of high and low pressure and of the prevailing winds, should be geared in together, like the cog-wheels of a great machine, is in no way surprising. The only surprising thing

is that attention has only recently been drawn to this important aspect of world meteorology.

The data relate to the years 1902, 1903, 1911, and 1912, and were derived from Scott's two expeditions, the Scottish National Antarctic Expedition, the Argentine Meteorological Office, the Nordenskjöld Expedition, and the German South Polar Expedition. A pronounced see-saw in the case of pressure and wind velocity at all seasons of the year seems to be established between McMurdo Sound (Ross Sea) and Laurie Island, South Orkneys. The temperature results, except in winter, are indefinite. The inquiry has been extended outside of the special areas under investigation with a view to ascertaining whether there are any seasonal correlations between McMurdo Sound and other places in adjacent latitudes of the southern hemisphere. Seasonal contrasts seem to exist between the Ross Sea and parts of West Australia, New Zealand, and southern South America.

Investigations of this kind are not only extremely interesting in themselves but they have a much larger importance because of the possibility which they suggest, in the future, of long-range forecasts. Of course, Antarctic meteorological data are rather discouragingly fragmentary, and therefore they do not yet lend themselves to the most satisfactory use. But we need just such painstaking work as Mr. Mossman is doing to emphasize the need of fixed observatories in high southern latitudes. R. DeC. Ward.

Levick, G. M. **Natural History of the Adélie Penguin.** Ills. *British Antarctic Expedition, 1910, Natural History Report: Zoology,* Vol. 1, No. 2, pp. 55-84. British Museum, London, 1915.

WORLD AS A WHOLE AND LARGER PARTS

Brown, W. C., and P. H. Johnson. **The Home of Man. Part 3: America.** (Series: The New Outlook Geography.) 282 pp. Maps, ills., index. G. G. Harrap & Co., London, 1914. 1s. 9d. 7½ x 5½.

This is one of a series covering various parts of the earth as the "Home of Man." The principal countries of North and South America are discussed in detail. From the number of questions interspersed with the subject-matter one judges that the book is intended as a text for elementary schools. Many of the questions are good because they are developmental in character. On the other hand, they are so arranged as to disturb continuity of thought, a factor, it would seem, very desirable for children.

Maps are frequent but not always good. The characteristic English black-and-white is used, with parallels and meridians lacking. The rather inaccurate abbreviations of the names of states upon the maps of the United States seem almost without excuse. The rainfall map of North America on pages 53 and 54 and the map on page 55 showing storm tracks in the United States could be more accurate. The map on page 110 entitled "Transcontinental Routes of British North America" leaves the impression that Duluth is in Canada. In the chapter on the History of North America, all too brief, the maps lack physical features and hence lose very much of their intended value.

With careful revision the book would have much greater value.

Eugene Van Cleef.

Bunting, W. L., and H. L. Collen. **A Geography of the British Empire.** 159 pp. Maps, ills., index. University Press, Cambridge, 1913. 10 x 7½.

The authors say that "this book is intended for the use of higher classes in [English] Preparatory Schools." The first part gives briefly some of the fundamental subjects of physical geography, and map reading. The authors have not intended to lay much stress on these subjects, for they write, "the early part makes no pretense at fullness but is to be regarded as the minimum of introduction to an elementary work of this kind." It is expected that the teacher will supplement the outlines given by illustrations of his own selection. The geography of the British Empire is considered, of course, in an elementary manner. The physiographic control over life and the development of the empire are discussed. Throughout the book geographical questions are asked which the pupil himself must solve. A good atlas is to be used with the text. There are numerous photographic illustrations and maps and diagrams in black and white.

Wilbur Greeley Burroughs.

Newbigin, M. I. **The British Empire Beyond the Seas: An Introduction to World Geography.** xii and 351 pp. Maps, diagrs., index. G. Bell & Sons, London, 1914. 3s. 6d. 7½ x 5.

A book for pupils who have both a rudimentary knowledge of world geography and a somewhat more detailed knowledge of the geography of the British Isles. The author

says that, within the limits of the time usually available in school, it is impossible to treat world geography as a whole in any detail; but if pupils are allowed to leave school with no knowledge of detail save in the case of the British Isles, they will have missed a very large part of the value to be obtained from geography. Because the British Empire contains types of practically all varieties of climate, surface, and modes of land utilization, the author treats the subject in such a manner that the pupil may acquire a knowledge of the conditions and principles of world geography by studying the British Empire. The relation of the inorganic to the organic is emphasized throughout.

The first part deals with the climate and cultivated plants of the empire; in the second part are considered those portions of the empire having cool or cold winters, warm summers and mild winters, hot regions with little native cultivation, hot regions with extensive native cultivation. Maps, diagrams, etc., are numerous. The book is well and interestingly written. WILBUR GREELEY BURROUGHS.

PHYSICAL GEOGRAPHY

GEOLOGY AND GEOMORPHOLOGY

REINECKE, LEOPOLD. **Average Regional Slope, a Criterion for the Subdivison of Old Erosion Surfaces.** 20 pp. Map, diagrs., ills. Reprinted from *Journ. of Geol.*, Vol. 24, 1916, No. 1. [Cover incorrectly gives 1915.]

It would be a great help in cases of disputed interpretations of old surfaces of erosion if the investigators presented at least the facts of slope declivity, for in such cases it is often not so much a question of the actual form as the stage in the erosion cycle which the form denotes. The Interior Plateau of British Columbia is at the present time in a very interesting stage of investigation. Nearly a half dozen interpretations have been made of the meaning of its erosion forms, but no one has hitherto presented the actual facts concerning the regional slopes of the province and their bearing on the possible interpretations.

The old upland surface of the Interior Plateau is obviously the product of a long erosion cycle. Its average slopes, measured from the higher areas of ridges between main drainage lines, vary from 150 to over 300 feet to the mile. The word "slope" in this case means the percentage of vertical to horizontal distance. For this investigation profiles, drawn in the direction of the main drainage lines and at right angles to them, assisted in determining whether the landforms are the result of one or more cycles of erosion, whether other than normal processes shaped the forms, and whether tilting or warping has taken place since the main erosion features were formed. It is argued that the criteria of plane-like surfaces, that is, the generally even sky-line, may exist in a surface whose detailed surfaces run from 100 to 300 feet to the mile; but they may be caused merely by the merging of several ridge lines of entirely different elevation in the observer's line of sight. Those unseen portions of the ridges which fall below the sky-line may have considerable declivity. It is also emphasized that the structure and topography are discordant not only in the case of the peneplain but also in the case of land surfaces in a late stage of development. This, however, is not a new conclusion. It has been pointed out before and is generally accepted by physiographers. The author suggests (1) that the term "peneplain" be restricted to surfaces with average slope of less than two per cent—that is, 105 feet to the mile—and (2) that surfaces of steeper gradient be referred to as "beveled hills," though it is doubtful whether so crude a phrase will gain general acceptance.

The paper is marred by the absence of some important acknowledgments.

DAVISON, CHARLES. **The Naming of Earthquakes.** *Nature*, No. 2412, Vol. 96, 1916, Jan. 20, p. 566.

HOLMSEN, GUNNAR. **Om jordlags langsomme glidning, solifluktion.** Diagr., ills. *Norske Geogr. Selskaps Aarbok*, Vol. 25, 1913-14, pp. 25-41. Christiania. [On solifluction.]

LEITH, C. K., AND W. J. MEAD. **Metamorphic Geology: A Text-Book.** xxiii and 337 pp. Diagrs., ills., index. Henry Holt & Co., New York, 1915. $2.50. 8½ x 6.

MONTESSUS DE BALLORE, F. DE. **A Problem in Seismological Geology: On the Seismogenic Influence of Parallel Shelf-Faults.** Maps, diagrs. *Bull. Seismolog. Soc. of Amer.*, Vol. 5, 1915, No. 3, pp. 150-154. [By "parallel shelf-faults" are meant the faults enclosing a rift valley. The Rhine *graben* between Basel and Mainz and the Erythrean rift valley are selected for discussion.]

METEOROLOGY AND CLIMATOLOGY

PENCK, ALBRECHT. **Die Formen der Landoberfläche und Verschiebungen der Klimagürtel.** *Sitzungsber. der Kgl. Preussischen Akad. der Wiss.*, 1913, No. 4, pp. 77-97. (Abstract in: EDUARD BRÜCKNER, **Albrecht Penck über die Verschiebung der Klimagürtel in der Quartärzeit.** Map. *Zeitschr. für Gletscherkunde*, Vol. 9, 1915, No. 4, pp. 276-283.)

PENCK, ALBRECHT. **The Shifting of the Climatic Belts.** Map. *Scottish Geogr. Mag.*, Vol. 30, 1914, No. 6, pp. 281-293.

In these two recent articles Professor Penck has advanced the hypothesis that climatic changes are due primarily to a shifting of climatic zones alternately equatorward and poleward. He apparently applies this hypothesis not only to the Glacial Period but to historic changes such as the "period of extreme dryness" of which "there are . . . many indications . . . some centuries after the beginning of the Christian era." The basis for this hypothesis is the contrast between the salt lakes, sand dunes, and general conditions on the poleward and equatorward sides of the great desert belts. For instance, Lake Chad on the equatorward side of the northern dry belt has the appearance of a newly formed lake which has not yet become highly saline and is still in process of enlargement, although it fluctuates greatly from decade to decade. The Dead Sea on the other side of the belt shows abundant evidences that it has long been diminishing in spite of its fluctuations. It is intensely salt and is surrounded by a large number of strands proving that the level has fallen. The lakes around Mexico City resemble Chad and present the same contrast with Great Salt Lake that Chad presents with the Dead Sea. Such facts "point to variations in climate, to increase of aridity on the polar side, to increase of humidity on the equatorial side. . . . Very characteristic are the phenomena of the Sahara. In the north there are living dunes consisting of wind-blown sand; the dead dunes, however, covered by sparse vegetation, are confined to the south, and these dead dunes stretch beyond the arid region far into the humid zone along the right bank of the Niger." In the same way on the equatorward side of the Kalahari Desert the dunes are dead and fixed, indicating that in the last few thousand years there has been an expansion of the area of tropical rains.

"All this leads us to assume that the area of extreme aridity in Africa once lay much nearer the equator than it does today, exactly as was the case in both Americas, and guided by the phenomena of the Great Basin we may fix this period in the Ice Age. The great Ice Age presents itself, then, neither as a period of extreme cold—as was originally held—nor as a period of excessive humidity over the whole earth, but as a period during which the climate belts of the world lay some four or five degrees nearer the equator, while the snow-line was found more than 3,300 feet lower. . . . The shifting of the climate belts, however, has never gone so far that one belt has entirely usurped the position of another." As a result of this some areas have grown drier and some have grown moister, while between them there have been relatively constant regions.

Penck's hypothesis of the shifting of climatic zones is identical with one reached independently and on wholly different grounds by the reviewer, whose conclusions were first published in an article on "The Shifting of Climatic Zones in Mexico" in the *Bulletin* of this Society in 1913 (Vol. 45, pp. 1-12 and 107-116). They were amplified in "The Climatic Factor," 1914, and in the *Bulletin of the Geological Society of America*, Vol. 25, 1914, pp. 477-590. The matter is so important that it is worth while to quote from "The Climatic Factor" a few words which were written before the reviewer had heard of Penck's hypothesis and which therefore strengthen the hypothesis by showing that different lines of study lead to the same conclusion. "Changes of climate are probably characterized by the shifting of the world's great climatic zones from north to south and the reverse" (p. 4.) . . . . "During the past 2,000 to 3,000 years . . . . the general shifting seems to have carried the conditions of more southerly regions into those farther north. This would mean that at the beginning of the Christian era or earlier the zone of westerly storms, during the winter but not necessarily in summer, lay farther south than today, and thereby made the present subtropical zone less arid than at present. The natural corollary of this would be that the subtropical zone of aridity was also displaced southward. This would have led to a diminution of winter rainfall and hence of vegetation along the northern edge of the equatorial zone. . . . . Thus jungle would have been caused to take the place of genuine, dense forests," (p. 190) and the Mayas of Central America would have been able to exist and flourish, although now their great ruins are in a region where progress is practically impossible because of the dense vegetation and devastating tropical diseases.

Penck attempts to explain the equatorward shifting of climatic zones during the Glacial Period by a lowering of terrestrial temperature, "which would bring about not only an advance in the snow-line, but at the same time a shifting of all the climatic

belts equatorwards. If the heat supply of the earth decreases, the atmospheric circulation will become less intense. The great areas of high pressure will become weaker and the horse latitudes must move toward the equator. And it is they that determine the position of the arid areas upon the land masses. Thus everything points to the fact that the . . . . climate of the Ice Age was a period of reduced heat supply.''

This last conclusion is open to question. Köppen and Newcomb have shown beyond the possibility of doubt that at times of many sunspots the earth's surface is cooler than normal (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 184-189). The work of Arctowski, Bigelow, Kullmer, and others shows with almost equal certainty that at such times the activity of the atmospheric circulation is greater than usual. The measurements of solar radiation by Abbott and others show that when sunspots are numerous the sun furnishes a heat supply greater than usual. Moreover, Hobbs has made it clear that today continental glaciation in Greenland and Antarctica is accompanied by markedly high atmospheric pressure. An increase of the extent of the glaciated areas would inevitably be accompanied by an increase in the size and intensity of the areas of high pressure. Thus there is good ground for thinking that instead of being a period of decreased heat supply, weaker barometric gradients, and gentler winds, as Penck's supposition demands, the Glacial Period may actually have been a time of increased heat supply, which gave rise to stronger barometric gradients, stronger winds, a consequent invasion of the more equatorial climatic belts by those lying toward the poles, and finally a greater removal of heat from the earth's surface by convection both at the equator and to a less degree farther poleward. If this supposition is true we may accept Penck's hypothesis of a shifting of zones but not his explanation of the cause. It seems probable that the shifting has been much more complicated than would appear at first sight, for the areas of continental and oceanic pressure as well as the general zones of climate enter into the problem. ELLSWORTH HUNTINGTON.

GALÁN, ANTONIO. **Climatic Fluctuations During the Historic Epoch.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 608. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HERRMAN, C. F. VON. **Position of Meteorology Among the Sciences.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 609. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HUMPHREYS, W. J. **Wind Velocity and Elevations.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 609. [Author's abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

HUNTINGTON, ELLSWORTH. **Solar Activity, Cyclonic Storms, and Climatic Changes.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, p. 609. [Abstract of a paper read at the Pan American Scientific Congress in Washington, Dec., 1915-Jan., 1916.]

PETTERSSON, O. **Climatic Variations in Historic and Prehistoric Time.** 26 pp. Maps, diagrs., ills. Reprinted from *Svenska Hydrogr. Biol. Kommiss. Skrifter*, No. 5, 1914. [Extended comment will be found in the article by Ellsworth Huntington on ''Climatic Variations and Economic Cycles'' in the March *Review*, pp. 192-202.]

TALMAN, C. F. **Meteorology and Seismology at the Pan American Scientific Congress.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 605-606. [Lists the papers read and is followed by selected abstracts of some of them. The titles of the majority of the abstracted papers are listed in this number in their respective places.]

THIEME, B. **Funkentelegraphische meteorologische Stationen.** Ills. *Meteorol. Zeitschr.*, Vol. 32, 1915, No. 10, pp. 449-460.

—— **Verandering van het klimaat in historischen tijd.** *Vragen van den Dag*, Vol. 21, 1916, No. 1, pp. 88-89.

ECONOMIC GEOGRAPHY

CLUTE, R. L. **Practical Lessons in Tropical Agriculture: Book I.** x and 228 pp. Ills., index. World Book Co., Yonkers, N. Y., 1914. 60 cents. 7½ x 5½.

At first thought, one would not expect the textbook that approaches an ideal to originate in the Philippines; yet this is precisely what has happened. This volume is one of the most teachable texts in recent years. Part I is entitled ''The Plant and Its Parts'' and Part II, ''Practical Applications of the Laws Governing Plant Life.'' In every instance the illustrations used for applying principles are taken from the Philippines and not from faraway lands. At the end of the chapters are exercises and questions which are good, common sense. The diagrams are clear and well done, so that any student of average ability may easily understand them. The book is alive, expressions being fresh and crisp, thus avoiding a lag in the child's interest. One striking feature is that, in discussing the theoretical phases of plant life, applica-

tions are made to food plants instead of the customary flowering plants. Thus at every turn the reader is acquiring practical information. The appendix includes instructions for making a balance and a rain-gage; a bibliography; and a classification of the more important economic plants of the Philippines. The index, consistent with the rest of the text, is very complete and comprehensive. EUGENE VAN CLEEF.

BOYER, JACQUES. **Kapok—A New Textile Fibre: Its Manufacture and Industrial Applications.** Ills. *Sci. Amer. Suppl.*, No. 2094, Vol. 81, 1916, Feb. 19, pp. 120-121. [A method of utilizing the down of the silk-cotton tree that flourishes in Java and elsewhere in the tropics.]

—— **Cassava: Its Cultivation and Utilisation.** *Bull. Imperial Inst.*, Vol. 13, 1915, No. 4, pp. 581-611.

DESCOMBES, PAUL. **Reforestation and Occult Condensation.** *Monthly Weather Rev.*, Vol. 43, 1915, No. 12, pp. 617-618. [Translated from the French original, published in *Comptes Rendus Assoc. Franç. pour l'Avanc. des Sci., 43me sess., Le Havre, 1914: Notes et Mém.*, pp. 337-341.]

JAGOW, KURT. **Der Hering im Volksglauben und in der älteren Forschung.** *Archiv. für Fischereigeschichte*, 1915, Oct., No. 6, pp. 213-247. Berlin.

LÖFGREN, ALBERTO. **A tamareira e seu cultivo.** 9 pp. Ills. *Inspectoria de Obras contra as Seccas Publ. No. 37.* Rio de Janeiro, 1912. [On the cultivation of the date-palm.]

MCADIE, ALEXANDER. **The Theory and Practice of Frost Fighting.** Diagrs., ills. *The Scientific Monthly*, Vol. 1, 1915, No. 3, pp. 292-301. [See abstract in the Feb. *Review*, p. 146.]

MOORE, H. L. **Economic Cycles: Their Law and Cause.** viii and 149 pp. Diagrs. The Macmillan Co., New York, 1914. $2. 9 x 6. [Extended comment will be found in the article by Ellsworth Huntington on "Climatic Variations and Economic Cycles" in the March *Review*, pp. 192-202.]

WARBURG, O. **Der Krieg und die koloniale Landwirtschaft.** *Der Tropenpflanzer*, Vol. 19, 1916, No. 1, pp. 1-24.

WILLIAMS, F. E. **Where Our Principal Minerals Come From.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 4, pp. 101-107.

HISTORY OF GEOGRAPHY AND EXPLORATION

ALEXANDER, P. F., edit. **The North-West and North-East Passages, 1576-1611.** (Series: Cambridge Travel Books.) xx and 211 pp. Ills. University Press, Cambridge (G. P. Putnam's Sons, New York), 1915. 75 cents. 8 x 5½.

The series to which this volume belongs is intended to make available the records of geographical discovery. The present volume covers but a short period, thirty-five years, and is devoted to six attempts to penetrate the Northwest Passage and one attempt on the Northeast. It includes two voyages of Frobisher, three of Davis, one of Hudson (his last), and one of Barents (his third). These accounts are the original records as written by the explorers or one of their companions, spelling and punctuation only having been modernized. The tales thus left as originally reported are more valuable than any transcription could be and have also a charm and atmosphere which could not be transferred. ROBERT M. BROWN.

BLAIKIE, W. G. **The Personal Life of David Livingstone, Chiefly from His Unpublished Journals and Correspondence in the Possession of His Family.** 508 pp. Map. Fleming H. Revell Co., New York, no date. 50 cents. 7½ x 5.

At the request of members of Livingstone's family Doctor Blaikie wrote this book to make the world better acquainted with the character of the great explorer, for in Livingstone's own books his modesty led him to say little of himself. Doctor Blaikie says: "Those who knew Livingstone best feel that little is known of the strength of his affections, the depth and purity of his devotion, or the intensity of his aspirations as a Christian missionary. The growth of his character and the providential shaping of his career are also matters of remarkable interest, of which not much has yet been made known." Even the history of Livingstone's African life is given more completely than in previous accounts, and many of the chapters contain material of which the public has known little or nothing.

Among the sources from which Doctor Blaikie has drawn intimate details of Livingstone's life are his unpublished journals, his correspondence with friends, and information furnished by relatives and friends, still living. The book makes an important addition to the works already published on this great missionary and Christian explorer.

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